5. Surface Water, Groundwater, and Sediments

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contributing authors:

David B. Rogers, Bruce M. Gallaher, Billy R. J. R. Turney, Robert S. Beers

Abstract

The Cerro Grande fire caused major physical changes in watersheds crossing the Laboratory boundary and resulted in large impacts on water chemistry. The area of greatest burn intensity was generally in the Jemez Mountains, in watersheds upstream (west) of the Laboratory boundary. Burning of trees and organic material on the forest floor removed material that previously absorbed rainfall, leading to increased runoff and erosion. Metals (for example, aluminum, iron, barium, manganese, and calcium) and fallout radionuclides (cesium-137; plutonium-239, -240; and strontium-90) previously bound to forest materials were concentrated in resulting ash and readily moved by runoff. Summer runoff events carried these fire-related constituents onto the Laboratory.

Strontium-90 data collected during 1999 were not used because of analytical laboratory method problems. For 2000, strontium-90 data are in keeping with earlier data: the highest values were found in known contaminated areas in Pueblo, Los Alamos, and Mortandad Canyons. Because of the mobilization of ash, the Cerro Grande fire resulted in higher strontium-90 values in many runoff samples.

Surface water samples are collected where effluent discharges or natural runoff maintain stream flow for several weeks or months during the year. For 2000 surface water samples, only one gross alpha measurement exceeded the Department of Energy (DOE) public dose derived concentration guides (DCG) value, at Mortandad at GS-1 below the Technical Area (TA) 50 Radioactive Liquid Waste Treatment Facility (RLWTF) outfall. Radioactivity measurements that exceeded drinking water standards occurred at locations with current or former radioactive liquid waste discharges: Acid/Pueblo Canyon, DP/Los Alamos Canyon, and Mortandad Canyon. In 2000, for the first time in many years, americium-241, plutonium-238, and plutonium-239, -240 in effluent from the TA-50 RLWTF outfall did not exceed the DCGs. The average TA-50 RLWTF effluent nitrate and fluoride concentrations were below the New Mexico groundwater standards. Aluminum, iron, and manganese concentrations in many surface water samples collected after the Cerro Grande fire were much higher than in previous years.

Runoff in otherwise dry drainages results from snowmelt or summer thunderstorms. Levels of most radionuclides and metals in 2000 runoff were higher than previously recorded in the Los Alamos area. In 2000, 28 gross alpha measurements in water runoff samples exceeded by 5 to 10 times the DOE public dose DCG at many locations upstream of and within the Laboratory boundary. One measurement slightly exceeded the DCG for gross beta. We use DCGs to screen runoff samples for cases of larger contaminant transport rather than to evaluate health risk. The DOE DCGs for public dose are determined assuming that two liters per day of water are consumed each year. Most of the gross alpha and gross beta radiation observed in these runoff samples can be attributed to high sediment loads after the fire and to naturally occurring radioactive potassium, thorium, and uranium, along with their daughter products, carried in that sediment. Of specific radionuclides measured, none occurred in runoff samples at levels above their respective DCGs for public dose. Dissolved concentrations of radionuclides and metals in runoff were below all Environmental Protection Agency (EPA) and DOE health-based drinking water standards, except in two samples. Values greater than the EPA drinking water limit for strontium-90 were recorded in lower Los Alamos Canyon at the new low-head weir and for antimony near the perimeter of Area G.

In 2000, because of the Cerro Grande fire, cesium-137 was found in many sediment samples at much higher values than previously noted. The sediment sampling again shows that plutonium occurs above fallout levels in Pueblo and Los Alamos Canyons and extends off-site from the Laboratory. Within Mortandad Canyon, the greatest radionuclide levels in sediments are found between the point where the TA-50 RLWTF effluent enters the drainage and the sediment traps, approximately a 3-km distance.

Sediment samples below the TA-50 RLWTF outfall again showed cesium-137 concentrations that were up to 4.4 times greater than the screening action level (SAL) value. Radionuclide levels near or slightly exceeding background levels are found downstream of the sediment traps, extending to the Laboratory/ San Ildefonso Pueblo boundary. A number of sediment samples near and downstream of the TA-54 Solid Waste Operations at Area G contained plutonium-238 and plutonium-239, -240 above background. We also found above-background levels of plutonium and americium in sediments downstream of Area AB, TA-49.

Continued testing of water supply wells in 2000 showed that high-explosives constituents are not present in Los Alamos County drinking water. Perchlorate (no drinking water standard) and tritium (at 1/500 of the drinking water standard) were discovered in water supply well O-1 in Pueblo Canyon during 2000. Other groundwater samples from the regional aquifer were consistent with previous results. Trace levels of tritium are present in the regional aquifer in a few areas where past liquid waste discharges occurred, notably beneath Los Alamos, Pueblo, and Mortandad Canyons. The highest tritium level found in a regional aquifer test well (near water supply well O-1) is about 1/50 of the drinking water standard. Nitrate concentrations in a test well beneath Pueblo Canyon remain elevated, but in 2000, they were only about half the drinking water standard. Except for above-background tritium in O-1, we detected no radionuclides other than naturally occurring uranium in Los Alamos County or San Ildefonso Pueblo water supply wells.

Analytical results for perched alluvial and intermediate-depth groundwater are similar to those of past years. Waters near former or present effluent discharge points show the effects of these discharges. No samples exceeded DOE DCGs for public exposure. Radioactivity measurements in perched alluvial groundwater that exceeded DOE DCGs for a DOE-operated drinking water system or EPA drinking water standards occurred at locations with current or former radioactive liquid waste discharges: Acid/ Pueblo Canyon, DP and Los Alamos Canyon, and Mortandad Canyon (these waters are not used as drinking water). The constituents exceeding drinking water DCGs or maximum contaminant levels (MCLs) were tritium, gross beta, strontium-90, and americium-241. Monitoring of fluoride and nitrate in Mortandad Canyon perched alluvial groundwater shows that these levels have dropped below NM groundwater standards during 2000 as a result of their reduction in the TA-50 RLWTF effluent.

During 2000, the Water Quality and Hydrology Group completed a move to send the majority of our environmental samples to external commercial laboratories for chemical analysis. These laboratories participate in programs such as the DOE Quality Assessment Program, which grades them on analysis of blind samples. One laboratory was consistently high in results for plutonium-238, plutonium-239, -240, and americium-241. This finding indicates that numerous apparent detections of plutonium in some groundwater samples are false positives resulting from a systematic analytical laboratory bias.

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A. Description of Monitoring Program

Studies related to development of groundwater supplies began at Los Alamos in 1945 under the direction of the US Geological Survey (USGS). In about 1949, the Atomic Energy Commission, the Los Alamos Scientific Laboratory, and the USGS jointly initiated studies aimed specifically at environmental monitoring and protecting groundwater quality. These initial efforts focused on Pueblo and DP/Los Alamos Canyons, which received radioactive industrial waste discharges in the early days of the Laboratory.

The current network of annual sampling stations for surface water and sediment surveillance includes a set of regional (or background) stations and a group of stations near or within the Los Alamos National Laboratory (LANL or the Laboratory) boundary. The regional stations establish the background quantities of radionuclides and radioactivity derived from natural minerals and from fallout affecting northern New Mexico and southern Colorado.

The Water Quality and Hydrology Group (ESH-18) takes groundwater samples from wells and springs within or adjacent to the Laboratory and from the nearby San Ildefonso Pueblo. The on-site stations, for the most part, focus on areas of present or former radioactive waste disposal operations, such as canyons (Figure 1-3). To provide a context for discussion of monitoring results, the setting and operational history of currently monitored canyons that have received radioactive or other liquid discharges are briefly summarized below.

For a discussion of sampling procedures, analytical procedures, data management, and quality assurance, see Section H below.

1. Acid Canyon, Pueblo Canyon, and Lower Los Alamos Canyon

Acid Canyon, a small tributary of Pueblo Canyon, was the original disposal site for liquid wastes generated by research on nuclear materials for the World War II Manhattan Engineer District atomic bomb project. Acid Canyon received untreated radioactive industrial effluent from 1943 to 1951. The Technical Area (TA) 45 treatment plant was completed in 1951, and from 1951 to 1964 the plant discharged treated effluents that contained residual radionuclides into nearby Acid Canyon. Several decontamination projects have removed contamination from the area, but remaining residual radioactivity from these releases is now associated with the sediments in Pueblo Canyon (ESP 1981).

The inventory of radioactivity remaining in the Pueblo Canyon system is only approximately known. Several studies (ESP 1981; Ferenbaugh et al., 1994) have concluded that the plutonium in this canyon system does not present a health risk to the public. Based on analysis of radiological sediment survey data, the estimated total plutonium inventory in Acid Canyon, Pueblo Canyon, and Lower Los Alamos Canyon ranges from 246 mCi to 630 ± 300 mCi (ESP 1981). The estimated plutonium releases were about 177 mCi, in satisfactory agreement with the measured inventory considering uncertainties in sampling and release estimates. About two-thirds of this total is in the Department of Energy (DOE)-owned portion of lower Pueblo Canyon.

Pueblo Canyon currently receives treated sanitary effluent from the Los Alamos County Bayo Sewage Treatment Plant in the middle reach of Pueblo Canyon. Perched groundwater occurs seasonally in the alluvium, depending on the volume of surface flow from snowmelt, thunderstorm runoff, and sanitary effluents. Tritium, nitrate, and chloride, apparently derived from these industrial and municipal disposal operations, have infiltrated to the intermediate perched groundwater (at depths of 37 to 58 m [120 to 190 ft]) and to the regional aquifer (at a depth of 180 m [590 ft]) beneath the lower reach of Pueblo Canyon. Except for occasional nitrate values, levels of these constituents are a small fraction of the Environmental Protection Agency (EPA) drinking water standards.

Starting in 1990, increased discharge of sanitary effluent from the county treatment plant resulted in nearly continual flow during most months except June and July in the lower reach of Pueblo Canyon and across DOE land into the lower reach of Los Alamos Canyon on San Ildefonso Pueblo land. From mid-June through early August, higher evapotranspiration and the diversion of sanitary effluent for golf course irrigation eliminate flow from Pueblo Canyon into Los Alamos Canyon. Hamilton Bend Spring, which in the past discharged from alluvium in the lower reach of Pueblo Canyon, has been dry since 1990, probably because there was no upstream discharge from the older, abandoned Los Alamos County Pueblo Sewage Treatment Plant. Farther east, the alluvium is continuously saturated, mainly because of infiltration of effluent from the Los Alamos County Bayo Sewage Treatment Plant. Effluent flow from Pueblo Canyon into Los Alamos Canyon generally extends to somewhere between the DOE/San Ildefonso Pueblo boundary and the confluence of Guaje and Los Alamos Canyons.

2. DP Canyon and Los Alamos Canyon

In the past, Los Alamos Canyon received treated and untreated industrial effluents containing some radionuclides. The upper reach of Los Alamos Canyon experienced releases of treated and untreated radioactive effluents during the earliest Manhattan Project operations at TA-1 (1942–1945) and some release of water and radionuclides from the research reactors at TA-2. An industrial liquid waste treatment plant that served the old plutonium processing facility at TA-21 discharged effluent containing radionuclides into DP Canyon, a tributary to Los Alamos Canyon, from 1952 to 1986. Los Alamos Canyon also received discharges containing radionuclides from the sanitary sewage lagoon system at the Los Alamos Neutron Science Center (LANSCE) at TA-53. The low-level radioactive waste stream was separated from the sanitary system at TA-53 in 1989 and directed into a total retention evaporation lagoon.

The reach of Los Alamos Canyon within the Laboratory boundary presently carries flow from the Los Alamos Reservoir (west of the Laboratory) as well as National Pollutant Discharge Elimination System (NPDES)-permitted effluents from TA-53 and TA-21. Infiltration of effluents and natural runoff from the stream channel maintain a shallow body of perched groundwater in the alluvium of Los Alamos Canyon within the Laboratory boundary west of State Road (SR) 4. Groundwater levels are highest in late spring from snowmelt runoff and in late summer from thundershowers. Water levels decline during the winter and early summer when runoff is at a minimum. Perched groundwater also occurs within alluvium in the lower portion of Los Alamos Canyon on San Ildefonso Pueblo lands. Intermediate-depth perched groundwater occurs in the lower part of the Bandelier tuff and the underlying Puye Formation and Cerros del Rio basalt at depths of a few hundred feet below the canyon bottom. This intermediate groundwater also shows some evidence of contamination from Laboratory sources.

3. Sandia Canyon

Sandia Canyon has a small drainage area that heads at TA-3. The canyon receives water from the cooling tower at the TA-3 power plant. Treated effluents from the TA-46 Sanitary Wastewater Systems (SWS) Facility are rerouted to Sandia Canyon. These effluents support a continuous flow in a short reach of the upper part of the canyon. Only during summer thundershowers does stream flow approach the Laboratory boundary at SR 4, and only during periods of heavy thunderstorms or snowmelt does surface flow extend beyond the Laboratory boundary.

4. Mortandad Canyon

Mortandad Canyon has a small drainage area that heads at TA-3. Its drainage area receives inflow from natural precipitation and a number of NPDES outfalls, including one from the Radioactive Liquid Waste Treatment Facility (RLWTF) at TA-50. The TA-50 facility began operations in 1963. The effluents infiltrate into the stream channel and maintain a saturated zone in the alluvium extending about 3.5 km (2.2 mi) downstream from the outfall. The easternmost extent of saturation remains on-site, ending about 1.6 km (1 mi) west of the Laboratory boundary with San Ildefonso Pueblo. Over the period of operation, the radionuclides in the RLWTF effluent have often exceeded the DOE derived concentration guides (DCGs) for public dose from drinking water (although this water is not used as drinking water). The effluent also contains nitrate that has caused perched alluvial groundwater concentrations to exceed the New Mexico groundwater standard of 10 mg/L (nitrate as nitrogen). In April 1999, the new reverse osmosis and ultrafiltration system at the RLWTF began operation. This system removes additional radionuclides and nitrate from the effluent, and discharges from the plant now meet the DOE public dose DCGs and the New Mexico groundwater standard for nitrate. The RLWTF effluent has met DOE DCGs continuously since December 10, 1999.

Perchlorate is a nonradioactive chemical compound containing a chlorine atom bound to four oxygen atoms and is used in a variety of industrial processes. At the Laboratory, perchlorate is a byproduct of the perchloric acid used in nuclear chemistry research. Perchlorate is on the EPA's contaminant candidate list, which under the Safe Drinking Water Act requires background investigations to determine a Maximum Contaminant Level (MCL). Perchlorate is present in the influent to the RLWTF at concentrations up to several thousand parts per billion (ppb). Perchlorate affects hormone production in the human thyroid and is a suspected, but not proven, carcinogen. The California Department of Health Services has issued a health advisory limit of 18 ppb for perchlorate in drinking water. The Laboratory is conducting pilot tests to remove perchlorate from the RLWTF effluent.

Continuous surface flow across the drainage has not reached the San Ildefonso Pueblo boundary since observations began in the early 1960s (Stoker et al., 1991). Three sediment traps located about 3 km (2 mi) downstream from the effluent discharge in Mortandad Canyon dissipate the energy of major thunderstorm runoff events and settle out transported sediments. From the sediment traps, it is approximately 2.3 km (1.4 mi) downstream to the Laboratory boundary with San Ildefonso Pueblo.

The alluvium is less than 1.5 m thick in the upper reach of Mortandad Canyon and thickens to about 23 m at the easternmost extent of saturation. The saturated portion of the alluvium is perched on weathered and unweathered tuff, generally with no more than 3 m of saturation. There is considerable seasonal variation in saturated thickness, depending on the amount of runoff experienced in any given year (Stoker et al., 1991). Velocity of water movement in the alluvium ranges from 18 m/day in the upper reach to about 2 m/day in the lower reach of the canyon (Purtymun 1974; Purtymun et al., 1983). The high turnover rate for water in the alluvial groundwater prevents accumulation of chemicals from the RLWTF effluent (Purtymun et al., 1977). The top of the regional aquifer is about 290 m below the alluvial groundwater.

5. Pajarito Canyon

In Pajarito Canyon, water perched in the alluvium is perched on the underlying tuff and is recharged mainly through snowmelt and thunderstorm runoff. Saturated alluvium does not extend beyond the facility boundary. Three shallow observation wells were constructed in 1985 as part of a compliance agreement with the State of New Mexico to determine whether technical areas in the canyon or solid waste disposal activities on the adjacent mesa were affecting the quality of shallow groundwater. No effects were observed; the alluvial groundwater is contained in the canyon bottom and does not extend under the mesa (Devaurs 1985).

6. Cañada del Buey

Cañada del Buey contains a shallow perched alluvial groundwater system of limited extent. The thickness of the alluvium ranges from 1.2 to 5 m, but the underlying weathered tuff ranges in thickness from 3.7 to 12 m. In 1992, saturation was found within only a 0.8-km-long segment, and only two observation wells have ever contained water (ESP 1994). Because treated effluent from the Laboratory's SWS Facility may at some time be discharged into the Cañada del Buey drainage system, a network of five shallow groundwater monitoring wells and two moisture monitoring holes was installed during the early summer of 1992 within the upper and middle reaches of the drainage (ESP 1994). Construction of the SWS Facility was completed in late 1992.

B. Overview of the Cerro Grande Fire Impacts on Los Alamos Watersheds

The Cerro Grande fire has had, and will continue to have, significant impacts on the landscape around Los Alamos. The impacts include physical, chemical, and hydrologic changes in the major watersheds crossing the Laboratory. These changes affect the monitoring program and our ability to accurately interpret the sampling results for all the media of surface water, groundwater, and sediments. In this section, we present some broad observations about what changes have been observed after other fires across the world and compare those with what changes we have observed after the Cerro Grande fire.

1. General Impacts of Fire on Watersheds

The aftermath of the Cerro Grande fire will be studied for years. Many of the fire impacts observed to date also have been recorded in studies of fires elsewhere, as well as locally with earlier crown fires in the Los Alamos area.

Watersheds undergo significant responses to wildfire in southwest ecosystems. The responses include changes in the runoff characteristics, sediment yield, and water chemistry. The burning of the understory and forest litter triggers many of these changes. Under pre-fire conditions, the grasses and brush within a forest canopy serve to slow and capture precipitation, nutrients, and sediments. In the absence of the vegetative cover, the runoff becomes flashier, with sharper, higher magnitude flood peaks. For example, after the 1977 La Mesa fire and the 1996 Dome fire in the Jemez Mountains, peak flows in Frijoles and Capulin Canyons were estimated to be 164 and 123 times greater than the pre-burn peaks, respectively (Veenhuis 2001). With less vegetative uptake and retention, the total water yields from burned watersheds are higher. Once the runoff begins, loose soils and ash are quickly removed from the steeper slopes. Fire-associated debris can be suddenly delivered directly to streams in large quantities.

Wildfires can also interrupt uptake of anions and cations by vegetation and speed mineral weathering. The concentrations of inorganic ions subsequently increase in streams after a fire (DeBano et al., 1979). The sudden addition of substantial quantities of chemically active carbon and minerals (like calcite) to the watershed initiates geochemical and pH changes.

To understand the chemical water quality changes noted in runoff water after the Cerro Grande fire, Bitner et al. (2001) compiled a summary of the reported effects of fire on runoff water chemistry and soils. For general inorganic parameters, increases of dissolved calcium, magnesium, nitrogen, phosphorous, and potassium and pH in runoff water have been observed as a result of fire. Metals and radionuclides have been much less studied, but manganese, copper, zinc, and cesium-137 have been observed to increase as a result of fire. Purtymun and Adams (1980) focused on water quality perturbations after the La Mesa fire and indicated a slight increase in calcium, bicarbonate, chloride, fluoride, and total dissolved solids (TDS) in the base flow of Frijoles Creek. Runoff samples showed elevated suspended sediment, barium, calcium, iron, bicarbonate, manganese, lead, phenol, and zinc concentrations. Base-flow water quality returned to normal three to five years after the fire.

Of note are studies that describe the concentration of fallout-associated radionuclides in ash and subsequently in runoff at other locations where forest fires have occurred (Amiro et al., 1996; Paliouris et al., 1995). The studies conclude that fire caused the mobilization of fallout radionuclides bound to the forest canopy, or in the forest litter, and concentrated them in the ashy layer of the burned surface soil available for erosion.

Studies indicate that these changes in chemistry and flow conditions are temporary, usually lasting less than five years, unless floods destroy the physical habitat of the streambed and hillsides. Reestablishment of vegetative ground cover appears to be a critical factor controlling the recovery.

2. Erosion and Flooding following the Cerro Grande Fire

The Cerro Grande fire burned major portions of watersheds draining onto LANL from adjacent Santa Fe National Forest lands, where from 20% to 90% of the acreage was considered high severity burn (Table 5-1). On LANL, most of the area burned was considered low severity burn, but numerous small structures burned, and the cover vegetation at some inactive waste sites was least partially burned.

The increases in runoff and sediment yields after the fire were anticipated to be severe because the burned terrain was so steep and the high severity of the burn created water shedding hydrophobic soils (BAER 2000). The Burned Area Emergency Rehabilitation Team (BAER) predicted peak flows (Table 5-2) from the upper watersheds after the fire hundreds of times larger than pre-fire conditions, even with aggressive post-fire rehabilitation treatments.

The recorded hydrologic and water quality responses to the Cerro Grande fire largely mirror those described for fires elsewhere. Comparing post- and pre-fire conditions showed significant changes in the magnitude of flooding, sediment yield, and water quality. This discussion will highlight the flooding and sedimentation changes during the summer runoff season of June through October 2000.

Precipitation in June from localized and brief thunderstorms totaled 1.47 inches, slightly higher than the normal of 1.36 inches. Precipitation in the months of July, August, and September was significantly below normal, with the usual summer monsoons largely absent. Only 50% of normal precipitation was received in July and August, and only 16% of normal precipitation was received in September. October was a relatively wet month with a total precipitation of 4.1 inches, 310% of normal.

Runoff in June and July from areas burned by the Cerro Grande fire was dramatic, although from historically insignificant rainfall amounts. The most destructive runoff event of the summer occurred on June 28 when a short-duration (30-minute), relatively high-intensity thunderstorm occurred over the flanks of the Sierra de los Valles, just west of the Laboratory. Rainfall recorded at TA-16 was 0.43 in., and the Water and Pajarito Canyons Regional Automated Weather Stations (RAWS) stations received 0.79 and 0.69 inches, respectively.

The June 28 precipitation caused flooding in canyons west of and across LANL. The ensuing floodwaters destroyed stream gages in Pajarito, Cañon de Valle, and Water Canyons. Record high discharges were observed in Pajarito, Cañon de Valle, and Water Canyons. The maximum estimated peak flow in Pajarito Canyon upstream of SR 501 was 1020 cfs, an all-time record for watersheds gaged by LANL on the

Pajarito Plateau (previous maximum flow of 520 cfs was from Ancho Canyon in 1993).

The maximum runoff yield before the fire from Pajarito, Cañon de Valle, and Water Canyons west of SR 501 was 1.26 $ft^3/s/mi^2$. The discharge yield on June 28 for these same locations ranged from 250 to 540 $ft^3/s/mi^2$, increasing more than 200 times from pre-fire peaks. These increases are two to four times greater than those estimated by Veenhuis (2001) for Frijoles and Capulin Canyons. Table 5-3a shows a comparison of peak discharges before and after the fire. Peak discharges of approximately 1000 cfs were calculated for several runoff events for the ungaged Rendija and Guaje Canyons to the north of LANL (Table 5-3b).

Post-fire runoff from burned areas was more flashy, more frequent, and with higher magnitude peaks than the runoff from the lesser burned areas. Along the downstream side of the Laboratory, the most pronounced changes were seen in the flow regimes of Pueblo and Water Canyons (Figure 5-1). Total runoff volume for the 2000 summer runoff season in Water Canyon increased two orders of magnitude from pre-fire averages, based on data from Shaull et al. (2000).

A major impact of the Cerro Grande fire was substantially increased transport of sediment onto and across the Laboratory. The initial runoff events of June and July carried abundant ash and sediment on a widespread basis, though fire impacts were seen locally in samples collected in late October.

We estimated changes in total suspended solids (TSS) concentrations by using an averaging technique (flow weighting) designed to account for the variation in sediment associated with a changing streamflow regime (Belillas and Roda 1993; Brown and Krygier 1971). To calculate the mass of sediment (load) carried in each runoff event, we multiplied the appropriate TSS concentrations by the water volumes entering or leaving the Laboratory during a specific storm event. Then we estimated the average sediment load in runoff by dividing the total mass of sediment by the total volume of water in all the sampled storm events. This technique normalized the effect of abnormal flow events after the fire, allowing for comparison with pre-fire conditions.

At most of the upstream monitoring stations above SR 501, the load of TSS per liter of water increased by 100 to 1000 times (Figure 5-2). At the downstream stations, changes in TSS concentrations were highly variable, apparently depending upon sediment deposition patterns and the burn history for the specific drainage. The largest downstream changes occurred in Pueblo and Water Canyons, with TSS concentrations increasing more than 100 times after the fire. The hydrologic and sediment transport regimes were not appreciably altered in the lesser-burned canyons of Cañada del Buey, Potrillo, and Ancho.

The data suggest that sediment deposition occurred between the upstream and downstream gages (Laboratory borders) in Los Alamos and Pajarito Canyons. Deposition has occurred in Los Alamos Reservoir, behind the Pajarito Retention Structure, and in the lower-gradient reaches of the canyons above SR 4.

3. Cerro Grande Ash as a Source of Elevated Radionuclides and Metals

The Cerro Grande fire left a large amount of residual ash in burned areas. We sampled ash and muck (post-fire sediments dominated by reworked ash) in locations representative of background conditions west (upstream) of the Laboratory. We also collected samples in the Viveash fire area (near Pecos, NM) for comparison. These data show that cesium-137; plutonium-239, -240; and strontium-90 concentrations in both areas were higher than pre-fire sediment and soils levels. An increase in the concentrations of several naturally occurring metals (for example, barium, manganese, and calcium) readily taken up into plant tissue was also observed. Radionuclides and metals increased by up to an order of magnitude in ash. This finding is consistent with the scientific literature showing that forest fires can condense and mobilize natural and fallout radionuclides and metals.

Based on a limited data set, the Cerro Grande ash appears to contain relatively higher plutonium-239, -240 levels than does the ash from the Viveash fire (Katzman et al., 2001a). We are attempting to determine whether past Laboratory air emissions are the source of the plutonium by looking at historical soil concentrations and other ash studies (see 6.A.2.g). Our preliminary analyses support the possibility that the elevated plutonium-239, -240 concentrations are partly attributable to Laboratory emissions.

The average concentration of cesium-137 in ash and muck is 4.4 pCi/g, about five times the upper limit of pre-fire background sediments and soils (Katzman et al., 2001b). Flood deposits sampled kilometers from the mountain-front source of ash show persistent elevated concentrations of the radionuclide and inorganic constituents, including flood deposits in watersheds unaffected by Laboratory discharges (Katzman et al., 2001b).

C. Surface Water Sampling

1. Introduction

The Laboratory monitors surface waters from regional and Pajarito Plateau stations to evaluate the environmental effects of its operations. No perennial surface water flows extend completely across the Laboratory in any canyon. Regional surface water samples are collected from rivers or reservoirs. Within and near the Laboratory, we collect surface water samples where effluent discharges or natural runoff maintain stream flow for several weeks or months during the year. Periodic natural surface runoff occurs in two modes: (1) spring snowmelt runoff that occurs over days to weeks at a low discharge rate and sediment load and (2) summer runoff from thunderstorms that occurs over hours at a high discharge rate and sediment load. This section discusses surface water results; runoff results are discussed in section 5.D. The surface water within the Laboratory is not a source of municipal, industrial, or irrigation water, though wildlife does use the waters. Activities of radionuclides in surface water samples may be compared with either the DOE DCGs or the New Mexico Water Quality Control Commission (NMWQCC 2000) stream standards, which in turn reference the New Mexico Environment Department's (NMED's) New Mexico Radiation Protection Regulations (Part 4, Appendix A). However, New Mexico radiation protection activity levels are in general two orders of magnitude greater than the DOE DCGs for public dose, so we will discuss only the DCGs here. The concentrations of nonradioactive constituents may be compared with the NMWQCC General, Livestock Watering, and Wildlife Habitat Standards. The NMWQCC (NMWQCC 2000) groundwater standards can also be applied in cases where groundwater outflow may affect stream water quality. Appendix A presents information on these standards.

2. Monitoring Network

We collect surface water samples from Pajarito Plateau stations near the Laboratory and from regional stations. We take surface water grab samples annually from locations where effluent discharges or natural runoff maintains stream flow. We collect regional surface water samples (Figure 5-3) from stations on the Rio Grande, Rio Chama, and Jemez River. These waters provide background data from areas beyond the Laboratory boundary.

Figure 5-4 shows surface water monitoring stations located on the Pajarito Plateau. We use samples from the stations to monitor water quality effects of potential contaminant sources such as industrial outfalls or soil contamination sites.

3. Radiochemical Analytical Results

Table 5-4 lists the results of radiochemical analyses for surface water samples for 2000. The table also lists the total propagated one sigma analytical uncertainty and the analysis-specific minimum detectable activity where available. Uranium was analyzed by isotopic methods rather than as total uranium for most samples in 2000; total uranium was calculated from these values using specific activities for each isotope.

To emphasize values that are detections, Table 5-5 lists radionuclides detected in surface water samples. Detections are defined as values exceeding both the analytical method detection limit and three times the individual one-standard-deviation measurement uncertainty. Laboratory qualifier codes are shown because some analytical results that meet the detection criteria are not detections: in some cases, the analyte was found in the blank or was below the method detection limit, but the analytical result was reported as the minimum detectable activity. Because uranium, gross alpha, and gross beta are usually detected, we indicate in Table 5-5 only occurrences of these measurements above threshold values. The specific levels are 5 μg/L for uranium (and do not include uranium isotopes on the list), 5 pCi/L for gross alpha, and 20 pCi/L for gross beta and are lower than the EPA MCLs or screening levels.

The right-hand columns of Table 5-5 indicate radiochemical detections that are greater than one-half of the DOE DCGs for public dose for ingestion of environmental water or the standards shown. Bear in mind that surface waters on the Laboratory are not used for drinking water.

In surface water samples, only one gross alpha measurement exceeded the DOE public dose DCG value in 2000, at Mortandad at GS-1 below the TA-50 RLWTF outfall. Measurements that exceeded drinking water standards occurred at locations with current or former radioactive liquid waste discharges: Acid/Pueblo, DP/Los Alamos, and Mortandad Canyons. Most of the measurements at or above detection limits are also from these locations with previously known contamination. A few of the measurements at or above detection limits were from locations that do not typically show detectable activity. Detections from locations outside the known contaminated areas in Pueblo, DP/Los Alamos, and Mortandad Canyons are discussed below.

Strontium-90 data collected during 1999 were not used because of analytical laboratory method problems. Some of the 1999 data, if correct, would have indicated unusually high levels of strontium-90 at some stations. For 2000, independent commercial laboratories performed the strontium-90 analyses. Detection limits (where given) for strontium-90 analysis ranged from about 0.1 pCi/L to 0.5 pCi/L for samples with smaller analytical results (detection limits for larger results may be higher). The 2000 strontium-90 data are in keeping with earlier data in that larger values are found in known contaminated areas in Pueblo, Los Alamos, and Mortandad Canyons. The Cerro Grande fire mobilized fallout-derived radionuclides such as cesium-137 and strontium-90 that had been associated with plant material. Therefore, levels of these radionuclides in runoff reaching the Laboratory's western boundary from the burned watersheds were higher after the fire than in previous years (Johansen et al., 2001). Detectable strontium-90 was found in post-fire samples from Pueblo Canyon surface water. The Pueblo Canyon watershed was severely burned during the fire.

a. Radiochemical Analytical Results for Surface Water. Several regional and perimeter stations had detections of radiochemical parameters. Because of the uncertainty inherent in sampling and analysis procedures for radionuclides, it is important to base a conclusion about their presence on the body of data from a station rather than on one detection. The regional station Rio Chama at Chamita showed a detection of strontium-90. Rio Grande at Frijoles and Rio Grande at Cochiti had detections of plutonium-238 in samples taken after the Cerro Grande fire. Frijoles at Monument Headquarters showed detectable strontium-90 and americium-241 in post-fire samples. Neither of these radionuclides was detected in analysis of a field duplicate sample. Perimeter stations Pajarito at Rio Grande and Ancho at Rio Grande showed detections of plutonium-238 or plutonium-239, -240. Analysis of a field duplicate sample did not support the plutonium-238 detection for Ancho at Rio Grande; the field duplicate sample showed no plutonium-238.

Stations SCS-1, SCS-2, and SCS-3 in Sandia Canyon showed detections of plutonium-238 or plutonium-239, -240. No apparent source exists in Sandia Canyon for this radioactivity. Cañada del Buey showed a detection of strontium-90, but it was not detected in a duplicate analysis of the sample.

b. Technical Area 50 Discharges. The cumulative discharge of radionuclides from the RLWTF into Mortandad Canyon between 1963 and 1977 and yearly discharge data for 1998 through 2000 appear in Table 5-6. In addition to total annual activity released for 1998 through 2000, Table 5-6 also shows mean annual activities in effluent for each radionuclide and the ratio of this activity to the DOE DCG for public dose. For the first time in many years, americium-241, plutonium-238, and plutonium-239, -240 did not exceed the DCG in 2000. As mentioned above, the new reverse osmosis and ultrafiltration system began operating at the RLWTF in 2000. This system is designed to remove additional radionuclides from the effluent and to ensure that the discharges meet the DOE public dose DCGs.

In response to a letter of noncompliance from the NMED, in March 2000 the RLWTF instituted a program to restrict the discharge of nitrogenous wastes into facility's collection system. Therefore, the nitrate (nitrate as nitrogen) concentration of all effluent discharge from the RLWTF during 2000 was less than 10 mg/L. The average 2000 effluent nitrate concentration (value of 2.5 mg/L, nitrate as nitrogen) was below the New Mexico groundwater standard of 10 mg/L and was much lower than the values for the previous two years.

The fluoride concentration in the discharge also has declined over the last few years. The 2000 effluent fluoride concentration (average value of 0.28 mg/L) was below the New Mexico groundwater standard of 1.6 mg/L.

4. Nonradiochemical Analytical Results

a. Major Chemical Constituents. Table 5-7 lists the results of analyses for major chemical constituents in surface water samples for 2000. The results are generally consistent with those observed in previous years, with some variability. The measurements in waters from areas receiving effluents show the effect of these effluents. None of the results was greater than one-half the standards with the following exceptions. The TDS values at Mortandad at GS-1 and SCS-1, 2, and 3 were over half the New Mexico groundwater limit and exceeded the EPA secondary drinking water standard. Several other TDS values (in Mortandad and Pueblo Canyons) exceeded half the EPA secondary drinking water standard. Sulfate at SCS-2 exceeded half the EPA secondary drinking water standard. The nitrate value for Mortandad at Rio Grande was about 60% of the NMWQCC groundwater standard. These stations are downstream from sanitary sewage or industrial effluent discharges.

Fluoride values at Jemez River and Mortandad at GS-1 were more than half the New Mexico groundwater limit but did not exceed the limit. The thermal waters from the Valles Grande caldera area have been shown to discharge through the Jemez River drainage, and wells and springs in the area have high boron, arsenic, and fluoride levels (Goff et al., 1988). Boron, arsenic, and fluoride are common constituents of water in volcanic areas or in thermal springs (Hem 1989). Fluoride at Mortandad at GS-1 results from effluent discharge from the RLWTF.

The laboratory pH in a sample from Water Canyon at Beta was 1.7, outside the EPA secondary drinking water range of 6.8–8.5. This result is likely a laboratory error and compares to a field measured pH of 7.9.

Perchlorate is a nonradioactive chemical compound containing a chlorine atom bound to four oxygen atoms and is used in a variety of industrial processes. At the Laboratory, perchlorate is a byproduct of the perchloric acid used in nuclear chemistry research. Industrial perchlorate uses also include solid fuels for rockets, high explosives, and fireworks; air-bag inflators; and electroplating, leather tanning, and rubber manufacturing. The EPA has not established a drinking water standard for perchlorate. Perchlorate is on the EPA's contaminant candidate list, which under the Safe Drinking Water Act requires background investigations to determine an MCL. According to an EPA fact sheet, present toxicology information suggests a provisional cleanup level of 4–18 ppb. The State of California, which has perchlorate contamination in drinking water supplies in some areas, has established a perchlorate water-supply action level for concentrations greater than 18 ppb. The State of New Mexico has not established an action level or regulatory standards for perchlorate. In 2000, the Environmental Surveillance Program collected surface water and groundwater samples for perchlorate analysis.

Perchlorate was detected in surface water at Mortandad at GS-1 at 39 ppb, or over twice the upper limit of EPA's provisional cleanup level. The perchlorate source is discharges from the TA-50 RLWTF, which processes wastewater from analytical chemistry facilities that perform actinide chemistry. Perchlorate was also found in surface water at Frijoles at Monument Headquarters and Pajarito at Rio Grande, but the analytical laboratory J-flagged these results, meaning that the quantities were estimated. Laboratory duplicates at both locations did not detect perchlorate.

b. Trace Metals. Table 5-8 lists the results of trace metal analyses on surface water samples for 2000. Samples collected for trace metal analysis were filtered so that they could be compared with the NMWQCC standards that apply to dissolved constituents. Samples collected for mercury and selenium analysis were unfiltered, as the NMWQCC standards for these analytes apply to total metal content. With some exceptions, the levels of trace metals in samples for 2000 are generally consistent with previous observations.

As in 1998 and 1999, several surface water, runoff, and groundwater samples showed detections of selenium in 2000. Typically, selenium has not been detected in surface water or groundwater on the Pajarito Plateau. The analytical detection limit for selenium in 2000 samples was 2.3 to 3.5 µg/L, below the New Mexico Wildlife Habitat Standard of 5 µg/L. New Mexico raised this standard from 2 µg/L to the current value in February 2000. Selenium did not exceed the standard in any surface water samples, but it was present at above half the standard at several stations in Pueblo, Sandia, Mortandad, and Water Canyons, as well as in the Rio Grande at two stations upstream from the Laboratory.

New Mexico raised the New Mexico Wildlife Habitat stream standard for mercury to 0.77 µg/L in February 2000 from 0.012 µg/L. The analytical detection limits in surface water in 2000 ranged from 0.03 to 0.1 µg/L. In 2000, no surface water samples had mercury exceeding half the standard.

Stations Jemez River, Pueblo 3, Pueblo at SR 502, and Mortandad at Rio Grande had boron exceeding half the New Mexico groundwater limit. Except for the Jemez River, these stations are all downstream from sanitary sewage discharges. The thermal waters from the Valles Grande caldera area have been shown to discharge through the Jemez River drainage, and wells and springs in the area have high boron levels (Goff et al., 1988). Boron is a common constituent of water in volcanic areas or in thermal springs (Hem 1989).

Aluminum, iron, and manganese concentrations exceed EPA secondary drinking water standards in surface water and runoff samples at many locations. Several studies (summarized in Bitner et al., 2001) have found that forest fires increase the concentrations of water-soluble manganese in soils. Manganese concentrations in many surface water samples collected after the Cerro Grande fire were much higher than previous values, particularly in Pueblo Canyon during July and August. A few of these manganese concentrations exceeded the New Mexico groundwater limit. Aluminum and iron also increased as a result of the Cerro Grande fire. These results reflect the presence of suspended solids or colloids in the water samples. Some of these cases occur with filtered samples. The results are due to naturally occurring constituents (that is, aluminum, iron, and manganese) of minerals in the suspended solids.

Mortandad at GS-1 had aluminum values that were about 20% of the New Mexico limits for use as irrigation water. Iron levels in SCS-2, Mortandad at GS-1, Cañada del Buey, and Frijoles at Monument Headquarters were about half the New Mexico groundwater limit. Iron values at Pajarito Canyon, Pueblo 3, and Pueblo at SR 502 were below half the New Mexico groundwater limit. Pajarito Canyon, Pueblo 1R, Pueblo 3, and Pueblo at SR 502 had higher than usual manganese concentrations. These concentrations exceeded the New Mexico groundwater limit by factors up to 12. Similar concentrations were found in nearby shallow alluvial groundwater samples in many cases.

c. Organic Constituents in Surface Water. Table 5-9 summarizes the locations where we collected organic samples in 2000. (See Section 5.H.2.c. for analytical methods and analytes.) We analyzed samples for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and polychlorinated biphenyls (PCBs). Some samples were also analyzed for high-explosive (HE) constituents. Table 5-10 shows organic compounds detected above the analytical laboratory's reporting level in 2000, as well as results from blanks. Most of the compounds detected were also found in accompanying blanks. The exception is the finding of acetone at Pueblo 3 on July 25. Acetone is, however, a common analytical contaminant found in samples during laboratory analysis for organic compounds.

5. Long-Term Trends

Long-term trends for surface water are discussed in Section 5.F with groundwater trends.

D. Runoff Sampling

1. Introduction

The Laboratory monitors runoff (storm water) from Pajarito Plateau stations to evaluate the environmental effects of its operations and to demonstrate compliance with permit requirements. Chapter 2 of this report contains a separate discussion of the Laboratory's compliance status. Periodic natural surface runoff occurs in two modes: (1) spring snowmelt runoff that occurs over days to weeks at a low discharge rate and sediment load and (2) summer runoff from thunderstorms that occurs over hours at a high discharge rate and sediment load. With drought conditions in early 2000, spring snowmelt runoff was essentially nonexistent. This section discusses the impacts of the summer runoff. Because of its short-lived nature, summer runoff is not a source of municipal, industrial, or irrigation water, though wildlife and livestock may use the waters. Runoff is important to monitor, however, as it is one of the principal agents for moving Laboratory-derived constituents off-site and possibly into the Rio Grande.

Activities of radionuclides in runoff samples may be compared with either the DOE DCGs or the NMWQCC stream standards, which in turn reference the New Mexico Environmental Improvement Board's New Mexico Radiation Protection Regulations (Part 4, Appendix A). However, New Mexico radiation protection activity levels are in general two orders of magnitude greater than the DOE DCGs for public dose, so we will discuss only the DCGs here.

The concentrations of nonradioactive constituents may be compared with the NMWQCC General, Livestock Watering, and Wildlife Habitat standards. The runoff quality can also be compared against the NMWQCC groundwater standards because of the possibility of seepage of dissolved constituents from the streambed into underlying shallow groundwater.

2. Monitoring Network

Runoff samples have historically been collected as grab samples from usually dry portions of drainages during or shortly after runoff events. As of 1996, we collect runoff samples using stream gaging stations, most with automated samplers (Shaull et al., 2000). Samples are collected when a significant rainfall event causes flow in a monitored portion of a drainage. Many runoff stations are located where drainages cross the Laboratory's boundaries. For the larger drainages, we sample runoff flows where they exit the Laboratory and at upstream locations. In contrast, runoff at several mesa top sites (for example, Material Disposal Area [MDA] G [Figure 5-5], MDA L, TA-55) is sampled at locations that target specific industrial activities, with negligible run-on from other sources. We sampled some events manually (grab samples) to supplement the automated samplers. Figures 5-6 and 5-7 show runoff monitoring stations on the Pajarito Plateau. We use samples from the stations to monitor water quality effects of potential contaminants sources such as industrial outfalls or soil contamination sites.

To document impacts of the Cerro Grande fire, we attempted to sample every runoff event during the runoff season. Unfortunately, the June 28 runoff event destroyed most samplers located along the Laboratory's western boundary (background stations). Between the automated samplers and additional manual grab samples collected after the stations were destroyed, however, a large range in both flow and water quality conditions was sampled along the western boundary. Based on precipitation records, we estimate that four probable light-to-moderate runoff events along the western boundary were not sampled after the destruction of stations in Pajarito, Cañon del Valle, and Water Canyons. We collected over 100 runoff samples from June through October, the majority from on-site locations.

3. Radiochemical Analytical Results for Runoff

Table 5-11 presents radiochemical analytical results for year runoff in 2000. The concentrations of radionuclides we measured in our samples are quite variable by location and through time, principally depending on whether ash from the Cerro Grande fire was present in the drainage at the time of sampling.

Comparison to Historical Levels

We evaluate the data by comparing it with historical levels and relevant standards and by looking for spatial and temporal trends. The benchmarks for comparing with historical levels are the pre-fire, 1995–1999, concentrations from runoff samples collected across the Laboratory. We use the 1995–1999 data set for comparison because, although runoff data were collected before 1995, the post-1995 data sampling methods were similar to those used for the current data. The pre-fire data set mainly includes results from Los Alamos Canyon and Cañada del Buey. For other drainages, pre-fire runoff was limited.

The year 2000 runoff concentrations of many radionuclides were greater than the Laboratory-wide pre-fire levels. Maximum pre-fire radionuclide concentrations in unfiltered runoff were exceeded for americium-241, cesium-137, plutonium-238, plutonium-239, -240, strontium-90, tritium, and uranium. The americium-241 and tritium maximums were seen at locations not impacted by the fire (DP Canyon at Mouth and Area G-6, respectively). In contrast, the high concentrations of cesium-137, plutonium-239, -240, strontium-90, and uranium were widespread and primarily related to the Cerro Grande fire. The most pronounced differences were for cesium-137 and uranium, with many samples exceeding the Laboratory-wide historical maximums by as much as 10 times. The increases in most of the radionuclide concentrations are attributable to two main factors: increased ash and sediment load in runoff and the enhanced constituent concentrations in the ash (see B.3.).

Radionuclide concentrations were significantly lower in filtered samples than in unfiltered samples. About 75% to 95% of the radioactivity in a runoff sample was typically associated with the sediments (ash, clay, silt, etc.) carried by the runoff rather than dissolved in the water.

Sources of Uranium in Runoff

Comprehensive analyses of the runoff samples for uranium isotopes were performed in year 2000. Naturally occurring uranium was present in the majority of the runoff samples, and Laboratory-derived uranium was generally not identifiable. This conclusion is supported by the following observations:

- Concentrations of uranium in unfiltered runoff leaving the Laboratory are similar to those measured in runoff entering the Laboratory in 2000 on days we were able to collect samples from both upstream and downstream locations.
- Median concentrations of uranium we calculated for the suspended sediment carried by the runoff leaving the Laboratory are similar to those measured in runoff entering the Laboratory (Figure 5-8), indicating that Laboratory sources made no distinctive addition as the runoff traversed LANL.
- Historically, LANL-derived uranium composed a small fraction of the total uranium found in Pajarito Plateau stream sediments and was not discernible in Rio Grande stream sediments

(Gallaher et al., 1997, 1999, in preparation). This statement is based on mass spectrometry analyses of stream sediments and of Cochiti Reservoir bottom sediments collected before the fire.

- Runoff samples collected along the Laboratory's downstream boundary were predominantly of a natural uranium isotopic composition. All but two of 18 samples contained uranium of natural composition (within 2σ uncertainty of natural). Enriched uranium was detected in two runoff samples collected in Los Alamos Canyon during the relatively small magnitude runoff events of June 2 and 3.

Fire Impacts on Runoff Quality

Evidence for substantial fire impacts on runoff includes the following:

- Many of the highest radionuclide concentrations were recorded at sample locations located upstream of LANL, above SR 501, and in samples taken from Rendija and Guaje Canyons north of the Laboratory. For example, in Guaje Canyon, calculated concentrations of cesium-137 in the suspended sediment of a July 9 runoff sample were approximately 10 times larger than pre-fire background levels (9.7 vs 1 pCi/g). The largest suspended sediment concentration (76,000 mg/L) measured on the Pajarito Plateau during 2000 was recorded for a sample collected in Guaje Canyon on August 8 and reflected natural sources. Figure 5-9 shows that the runoff flowing onto the Laboratory after the fire contained about 2 orders of magnitude higher levels gross alpha and gross beta activities than before the fire.
- Cesium-137 concentrations generally show a decline through the runoff season, as ash is flushed downstream.

The introduction of fire-derived radionuclides into most of the LANL watercourses masks the Laboratory's contribution of these radionuclides. The levels of many radionuclides changed as a result of ash in the runoff. For most of the canyon runoff samples collected in 2000, LANL impacts are not discernible because of the higher radionuclide concentrations in the ash.

Consistent with pre-fire conditions, Laboratory impacts are indicated in DP Canyon, around MDA G, and in early (June 2 and 3) runoff events in Los Alamos Canyon. The levels of americium-241 and strontium-90 at DP Canyon at Mouth and the tritium in two samples from G-6 have not been recorded before and indicate LANL impacts. Laboratory impacts are also identifiable in the first runoff events of the season in Los Alamos Canyon, June 2 and 3 (Johansen et al., 2001).

To gain a Laboratory-wide picture of how transport of radionuclides along the Laboratory's downstream boundary trended through the runoff season, we aggregated runoff volume and quality data for the individual drainages. On a monthly basis, we compiled average loads of radionuclides (suspended and dissolved) carried in a given volume of runoff. We used an averaging technique (flow weighting) designed to account for the wide variation in stream flow before and after the fire. For each summer runoff month of 2000, we calculated average radionuclide loads by dividing the total quantity (load) of each radionuclide by the total runoff volume recorded for the month. In the end, an average (flow-weighted) concentration (activity per liter of water) for each radionuclide is calculated. This technique normalized the effect of abnormal flow events after the fire, allowing for comparison through the runoff season and with pre-fire levels.

Figure 5-10 shows that peak concentrations occurred in June and July, with 5- to 20-fold increases above pre-fire averages during these months for cesium-137, strontium-90, and uranium. Concentrations of these same analytes dropped considerably during August, September, and October. The decline in runoff concentrations is partly due to flushing of ash from the LANL drainages during June and July and the occurrence of less-intense, late season rainfall events in August, September, and October that largely missed the mountains west of the Laboratory. Evidence for some flushing of ash from the drainages is presented in Figure 5-11, which indicates a general decline in calculated cesium-137 activities in the suspended sediment, particularly in Water Canyon.

Comparison of Radioactivity in Runoff with Standards

Water quality standards have not been established specific to most radionuclides in runoff. We compare the results for unfiltered water samples with DOE DCGs for public exposure and NMWQCC General, Livestock Watering, and Wildlife Habitat standards (Table 5-12). We further compare the results for filtered waters with appropriate EPA drinking water standards or DOE DCGs for drinking water systems (Table 5-13). Lastly, we screen for significant concentrations in the suspended sediment by comparing them with Screening Action Levels (SALs) for sediments.

Gross Alpha and Gross Beta Activity

In unfiltered samples, gross alpha concentrations were greater than public dose DCG levels (30 pCi/L) and State of New Mexico Livestock Watering Standards (15 pCi/L) at many locations upstream of and on the Laboratory. The gross alpha DCG is based on the most restrictive anthropogenic alpha emitters (plutonium-239, -240 and americium-241) and is commonly exceeded by runoff laden with naturally derived alpha emitters (such as from the uranium decay series). The New Mexico Livestock Standard excludes radon and uranium from the alpha limit. The gross beta activity DCG for public dose was slightly exceeded in a sample from Rendija Canyon, north of Laboratory operations.

Figure 5-12 shows that levels of gross alpha and beta radioactivity in unfiltered runoff samples were related to the concentrations of TSS in the water. That is, the most sediment-laden samples contained the highest total radioactivity. This relationship holds for samples collected above (upstream), on-site, and along the downstream side of the Laboratory. A sample of an intense, short-lived runoff event will generally contain higher total alpha and beta radioactivity levels than a sample taken from the same location under slower flows with less sediment carrying power. While some of the gross alpha and gross beta activity in 2000 was associated with ash, the relationship with TSS also was seen in pre-fire samples. The higher waterborne gross alpha and gross beta levels do not indicate that some new contaminant source has contributed to increased levels, but that more sediment is being transported in these events.

In 1999, we were unable to account for gross alpha and beta activities in the runoff samples using the nuclides we measured. For the year 2000 samples, we also analyzed the uranium and thorium isotopes. Our analyses indicate that naturally occurring potassium as well as uranium and thorium isotopes and their daughter decay products accounted for most alpha and beta activity. These daughter products are not observed in our analyses (and often are short-lived) but can be evaluated from the measured uranium and thorium concentrations. Within the accuracy of the analytical methods, the levels of gross alpha and gross beta radiation observed in these runoff samples can be attributed to high sediment loads (caused by erosion) and the naturally occurring levels of potassium, thorium, and uranium, along with their daughter products, carried in that sediment.

Comparison of Specific Radionuclides with Standards

Of the specific alpha and beta emitters measured, none occurred in runoff samples at levels above their respective DCGs for public exposure. Total concentrations of anthropogenic radionuclides greater than 15 pCi/L were seen for plutonium-239, -240 (lower reaches of Guaje, Rendija, Pueblo, and Los Alamos Canyons) and for americium-241 (DP Canyon Mouth). The levels of these individual isotopes exceed the New Mexico Livestock Watering standard for gross alpha activity.

All filtered samples met EPA and DOE drinking water standards, except one. The strontium-90 standard was exceeded in a single sample from the Los Alamos Weir, a structure installed after the fire in lower Los Alamos Canyon as a sediment catchment. The source of the strontium-90 in that sample could be either fire-related or derived from Laboratory operations. Dissolved strontium-90 levels generally were the highest of the individual isotopes, relative to the standards. More than 10 samples contained dissolved strontium-90 levels that were greater than one-half the EPA drinking water standard. We detected dissolved cesium-137 and americium-241 at levels more than half the DOE drinking water DCG in Area G runoff samplers G-2 and G-4, respectively.

Concentrations of Radionuclides in Suspended Sediment

Because the suspended solids make up such a large portion of the total radionuclide load in the runoff samples, we examined the suspended sediment for significant levels of the individual radionuclides. This analysis identified cesium-137 as the radionuclide likely to be of most concern from a public exposure perspective. In approximately 13 runoff samples, the concentrations of cesium-137 in the suspended sediment fraction of the runoff were calculated to be greater than Laboratory soil screening action levels (ER 2000). These measurements commonly occurred in samples taken at the upstream boundary of LANL, where the radionuclides should be primarily derived from worldwide fallout carried by ash. The largest cesium-137 concentration in suspended sediment was seen in a sample from Two Mile Canyon above SR 501, at levels approximately 12 times above the SAL

(Table 5-14). In the majority of the cases, the concentrations of cesium-137 exceeded the SAL by less than a factor of 2. We assume that because of further downstream mixing, the concentrations in sediment found in deposits after the runoff events will likely be substantially lower than those found in the runoff samples.

Long-Term Trends

We have monitored summer runoff quality with the automated samplers for only a few years. The monitoring has not been conducted long enough to evaluate long-term trends quantitatively. We performed an initial broad comparison of how the quality of Laboratory runoff has varied over recent years. First, we combined available flow and analytical measurements since 1997 and calculated the annual average (flow-weighted) concentrations of radionuclides measured in summer runoff events at the downstream LANL stations. We excluded the strontium-90 results for 1999 from this data set because of quality assurance concerns. The flow-weighted average gauges the average load of radioactive material carried in a given volume of runoff. The yearly averages indicate whether off-site transport has changed at the Laboratory's downstream boundary.

Figure 5-13 shows the results of this initial analysis. We saw no discernible trends in the data, except for the obvious increases in cesium-137, strontium-90, and uranium transport during year 2000. For the other isotopes, average concentrations appear to vary within the same order of magnitude over the period of record.

4. Nonradiochemical Analytical Results

a. Major Chemical Constituents. Table 5-15 lists the results of analyses for major chemical constituents in runoff samples for 2000. The concentrations of many constituents were elevated above levels observed in previous years. We noted increases for total alkalinity, calcium, magnesium, potassium, total phosphorous, and cyanide concentrations. Studies at other off-site locations show increases in many minerals and nutrients following fire (DeBano et al., 1979; Helvey et al., 1985; Tiedemann et al., 1978; Belillas and Roda 1993). These increases were generally due to release of these constituents by fire, changes in chemical states and complexation, and changes such as increased pH in the post-fire environment.

None of the LANL results approached or exceeded the standards with the following exceptions. TDS values in most of the major drainages were over half the EPA drinking water standard and exceeded the standard in a single sample of runoff at Guaje Canyon at SR 502.

The values for cyanide in its free (amenable), unbound form were greater than the NMWQCC General, Livestock Watering, and Wildlife Habitat Standards in three samples from Water Canyon and possibly in several other samples where the analytical detection limits were greater than the standard. Cyanide (amenable) is toxic to aquatic biota and wildlife. However, most of the cyanide appears to be in a far less toxic form bound with other elements. There is no surface water standard for total cyanide, and all values are below the NMQCC groundwater standard of 200 µg/L.

One possible source of the cyanide may have been fire retardant used in the Cerro Grande fire that contained a sodium hexaferrocyanide compound added as an anticaking additive and as a corrosion inhibitor. Another possibility is that some cyanide may have been naturally created through slow burning or smoldering of biomass (Yokelson et al., 1997) and then transported in the runoff along with the ash.

Figure 5-14 shows that cyanide levels in runoff declined progressively through the runoff season. Additional monitoring during the 2001 runoff season will determine if a cyanide source(s) remains in the burned area.

b. Trace Metals. Table 5-16 presents trace metals analytical results for year 2000 runoff. Analysis of runoff waters typically was performed for 23 metals. Both filtered and unfiltered samples were analyzed. Samples were filtered so that they could be compared with the NMWQCC standards that apply to dissolved constituents. Samples collected for mercury and selenium were unfiltered, as the NMWQCC standards for these analytes apply to total metal content. In general, metals concentrations in filtered samples were lower than concentrations in unfiltered samples. This relationship indicates that the metals are generally associated with the particulate and sediment carried by the runoff rather than dissolved in the water.

For nearly every metal, the levels in both filtered and unfiltered runoff samples for 2000 were significantly higher than in prior years. Corresponding to the radionuclides, the increase in metals concentrations is due to the increased sediment and ash related to the Cerro Grande fire. The largest increases in dissolved metals concentrations were seen for barium, manganese, strontium, and uranium. Substantial increases in total metal concentrations were recorded for arsenic, boron, barium, chromium, copper, manganese, silver, strontium, uranium, vanadium, and zinc. In general, these increases are consistent with those reported in the scientific literature for fire impacts (see section 5.B.1.). Total manganese, for example, found in plants before fire, is easily reducible by fire processes leading to subsequent increased concentrations in soil and water (Chambers and Attiwill 1994; Parra et al., 1996; Auclair 1997). Similar conclusions were reached in studies on copper and zinc (Auclair 1997).

Dissolved and total metals concentrations in runoff varied through the runoff season, as illustrated in Figure 5-15 for selected dissolved metals. In general, levels recovered to near pre-fire conditions by the end of October.

Comparison with Standards

Selenium exceeded the New Mexico Wildlife Habitat Standard of 5 µg/L in several samples in most of the major Pajarito Plateau drainages. We detected the largest values in Pajarito and Water Canyons during the June 28 runoff event, which carried much ash from the burned area. Selenium values more than 10 times the wildlife standard were detected in samples collected above and across the Laboratory in the flood event. Selenium at levels above the wildlife standard was indicated in several samples collected around MDA G, but the analytical laboratory B-flagged (meaning selenium levels were also detected in the accompanying analytical blanks) these, casting doubt on their reliability.

Mercury was detected at levels exceeding the New Mexico Wildlife Habitat Standard of 0.77 µg/L at three locations, and at two additional locations it was more than half the standard. All of these were detected in samples taken from Pajarito and Water Canyons during the ash-laden June 28 runoff event. One of these exceedances was in a sample taken upstream of the Laboratory in Pajarito Canyon.

Aluminum, iron, and manganese concentrations exceeded EPA secondary drinking water standards in filtered runoff in many locations. Occasionally, these metals concentrations exceeded the New Mexico groundwater limits. It is unlikely that people will directly ingest the runoff; comparisons are made here with drinking water standards because the dissolved constituents in the runoff potentially could affect groundwater quality. In several samples, the filtered aluminum concentrations exceeded the EPA secondary drinking water standard by more than 50 times. A single sample taken upstream of the Laboratory in Starmer’s Gulch, a tributary of Pajarito Canyon, exceeded New Mexico Livestock Watering Standards for aluminum. These results reflect naturally occurring constituents of minerals whose levels are enhanced by forest fire effects.

We detected antimony at station G-6 in three filtered runoff samples at levels more than half the EPA primary drinking water standard, with one result slightly above the standard. A 1999 filtered runoff sample from the same station showed similar results. The source of the antimony around MDA G is uncertain. Antimony also exceeded the EPA drinking water standard in a runoff sample from Rendija Canyon, north of LANL operations, and is presumably derived from natural sources.

Concentrations of Metals in Suspended Sediment

Because the suspended solids compose such a large portion of the total metals load in the runoff samples, we examined the suspended sediment for significant levels of the individual metals. Table 5-17 compares screening levels against calculated metals concentrations associated with the suspended sediments for cases where both filtered and unfiltered samples were obtained for runoff samples. We determined the values by subtracting the filtered results from the unfiltered results, using the total suspended solids measured in the samples. The associated uncertainties were calculated using propagation of errors. This is a method of determining how measurement errors affect the results of a calculation using these measurements.

This analysis identified manganese as the metal likely to be of most concern from a public exposure perspective. The concentrations in the suspended sediment fraction of the runoff were calculated to be greater than residential EPA soil screening levels (EPA 2000) for manganese in 8 samples. These measurements commonly occurred in samples taken in Pajarito Canyon and Water Canyons both on-site and along SR 501 upstream of LANL, where the metals should be primarily derived from natural sources. Manganese levels in four samples were more than two times the SAL. We assume that because of further downstream mixing, the concentrations in sediment found in deposits after the runoff events will likely be substantially lower than those found in the runoff samples.

Long-Term Trends

We have monitored summer runoff quality with the automated samplers for only a few years, not long enough to evaluate long-term trends quantitatively. We performed an initial broad comparison of how the quality of Laboratory runoff has varied over recent years. First, we combined available flow and analytical measurements since 1997, when the downstream boundary of the Laboratory became effectively monitored with the automated samplers, and calculated the annual average (flow-weighted) concentrations of metals measured in summer runoff events at the downstream LANL stations. The flow-weighted average gages the average quantity (load) of trace metals carried in a given volume of runoff. The yearly averages indicate whether off-site transport has changed at the Laboratory's downstream boundary.

The results are shown in Figure 5-16. When compared with levels seen in the three years before the fire, substantial increases occurred during 2000 in average metals concentrations of arsenic, boron, barium, chromium, copper, manganese, strontium, uranium, silver, vanadium, and zinc. We saw increases 5 to 10 times above pre-fire levels for most of these metals. In addition, concentrations of antimony, nickel, lead, and tin doubled after the fire.

The pre-fire average concentrations typically varied within about one-half an order of magnitude. Within these limited ranges, however, there is a suggestion of upward trends in some pre-fire metals concentrations. Over the three pre-fire years for which we have summer runoff data, average concentrations progressively increase for barium, beryllium, cobalt, nickel, lead, manganese, strontium, and zinc. The interpretation of this preliminary finding is not clear. More study is needed to determine if the indicated trends can be isolated to individual drainages.

c. Organic Constituents in Runoff. Table 5-9 summarizes the locations where we collected organic samples in 2000. (See Section 5.H.2.c. for analytical methods and analytes.) We analyzed samples for volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs). Some samples were also analyzed for HE constituents, PCBs, and dioxins/furans. Table 5-18 shows organic compounds detected above the analytical laboratory's reporting level in 2000.

The only VOC detected in 2000 was 1,4-dichlorobenzene. All three detections of this compound were at levels very near the analytical detection limit and were at stations upstream of the Laboratory.

Detections of semivolatile organic chemicals included bis(2-ethylhexyl)phthalate, benzoic acid, benzyl alcohol, 2-methylnapthalene, and pyridine. The benzoic acid, benzyl alcohol, and pyridine are thought to be end products of combustion of forest fuels. Benzoic acid was detected throughout the runoff season in many fire-impacted drainages, and pyridine was detected in Guaje Canyon, north of the Laboratory. There is no definitive source for the bis(2-ethylhexyl)phthalate, but it is commonly recognized as introduced in analytical laboratory analysis.

PCBs and dioxins/furans were not found in runoff above analytical detection limits.

Relatively small concentrations (low parts-per-billion) of HE compounds were detected in runoff in the Water Canyon drainage system. HMX was detected in Indio Canyon at SR 4 on June 28, and HMX and RDX were detected in a runoff sample collected in lower Water Canyon at SR 4 in late October. HMX and RDX are present in surface water and spring discharges in this drainage system at comparable levels.

Several other HE compounds (tetryl and several isomers of nitrobenzene and nitrotoluene) were also possibly detected, but most of these were likely false detections. Because of the high ash content in the samples, there were interference effects with the requested analytical method. Few of these HE detections were confirmed using an alternate analytical method (UV-Diode Array) that is not susceptible to ash effects. The suspect values are shown with an X-qualifier in Table 5-18. These other HE compounds were detected only in the large runoff event of June 28, primarily in samples taken upstream or north of the Laboratory.

Assuming the false HE detections, all of the organic chemical detections were at levels below the EPA Region 6 screening values for tap water (EPA 2000), with two exceptions. A sample from MDA G station G-4 contained bis(2-ethylhexyl)phthalate at a level approximately three times larger than the EPA screening level. The RDX detected in lower Water Canyon slightly exceeds the EPA screening level.

d. Toxicity Monitoring of Runoff Quality. The Laboratory and the NMED DOE Oversight Bureau collected five runoff and two surface water samples in September 2000 for acute and chronic biological toxicity testing. Table 5-19 presents sample locations and test results. The EPA Region 6, Houston Branch, conducted all the toxicity monitoring. In the acute test, a population of daphnia (an aquatic invertebrate, *Ceriodaphnia dubia*) was exposed for 48 hours to various dilutions of water decanted off centrifuged runoff samples. They used runoff dilutions of 0 (lab control), 6.25, 12.5, 25, 50, and 100% (undiluted runoff) to establish a dose-response relationship, if any, for survival of the insect. An acceptable survival rate is 20% lower than the control sample. None of these samples showed significant acute effects.

The chronic tests used two different test organisms. A population of daphnia was exposed for seven days to a control sample and to undiluted water decanted off centrifuged runoff sample to look for survival and reproduction effects, whereas the embryo and larvae of fat head minnows (*Pimephales promelas*) were studied for survival and teratogenicity effects. Five samples showed no significant chronic effects. However, two runoff samples that NMED collected from upper Pueblo Canyon showed 70% and 100% mortality and significantly reduced reproduction in the 7-day Survival and Reproduction daphnia test. These samples were taken near the mountains, upstream of LANL discharges and above most urbanization in Los Alamos. The specific source(s) of the toxicity has not been identified. The Laboratory will expand biological monitoring during 2001 to include other drainages and snowmelt.

E. Sediment Sampling

1. Introduction

Sediment transport associated with surface water runoff is a significant mechanism for contaminant movement. Contaminants originating from airborne deposition, effluent discharges, or unplanned releases can become attached to soils or sediments by adsorption or ion exchange.

There are no federal or state regulatory standards for soil or sediment contaminants that we can use for comparison with the Laboratory's environmental surveillance data. Instead, contaminant levels in sediments may be interpreted in terms of toxicity because of ingestion, inhalation, or direct exposure. The Laboratory's Environmental Restoration (ER) Project uses SALs to identify contaminants at concentrations or activities of concern. SALs are screening levels selected to be less than levels that would constitute a human health risk. SAL values are derived from toxicity values and exposure parameters using data from the EPA. Contaminant levels in sediments may also be compared with residential soil screening levels developed by EPA Region 6 (EPA 2000). These screening levels are derived from toxicity data and are currently used as SALs by the ER Project.

We can also compare the data with activities of radionuclides resulting from atmospheric fallout or from naturally occurring radionuclides. We used radionuclide analyses of sediment samples collected from regional stations for the period 1974 to 1986 to establish background activities from atmospheric fallout of radionuclides and to determine the background concentrations of naturally occurring uranium (Purtymun et al., 1987). McLin et al. (in preparation) developed provisional background levels for data from the period 1974 to 1996. In this study, the authors determined separate values for reservoir sediments and river sediments. Differences in grain size and depositional setting lead to different levels of accumulation for fallout-derived radionuclides in these two environments. We use the 0.95 quantile activity of each of the radionuclides in the regional station samples as an estimate of the upper limit of background values. If the activity of an individual sediment sample is greater than the estimated background value, we consider the Laboratory as a possible source of contamination. Tables summarizing analytical results list the reservoir and river background and SAL values for sediments.

2. Monitoring Network

Sediments are sampled in all major canyons that cross the Laboratory, including those with either perennial or ephemeral flows. We also sample sediments from regional reservoirs and stream channels annually.

Regional sediment sampling stations (Figure 5-3) are located within northern New Mexico and southern Colorado at distances up to 200 km from the Laboratory. Samples from regional stations provide a basis for estimating background activities of radionuclides resulting from atmospheric fallout or from naturally occurring radionuclides. We obtained regional sediment samples from reservoirs on the Rio Grande and the Rio Chama and at stations on the Rio Grande and Jemez River.

Stations on the Pajarito Plateau (Figure 5-17) are located within about 4 km of the Laboratory boundary, with the majority located within the Laboratory boundary. The information gathered from these stations documents conditions in areas potentially affected by Laboratory operations. Many of the sediment sampling stations on the Pajarito Plateau are located within canyons to monitor sediment contamination related to past and/or present effluent release sites. We sampled three major canyons (Pueblo, Los Alamos, and Mortandad Canyons) that have experienced past or present liquid radioactive releases from upstream of the Laboratory to their confluence with the Rio Grande.

We also collected sediments from drainages downstream of two material disposal areas. Area G at TA-54 is an active waste storage and disposal area. Nine sampling stations were established outside its perimeter fence in 1982 (Figure 5-5) to monitor possible transport of radionuclides from the area. The surface drainage changed, and we dropped two sampling stations in 1998 and added four others. G-4 R-1 and G-4 R-2 replaced station G-4. G-6 was located in a channel that received runoff that was not entirely from Area G. G-6R replaced G-6 and is located in a stream channel that receives runoff only from Area G. Station G-0 was added on the north side of Area G in a drainage that flows to Cañada del Buey.

Area AB at TA-49 was the site of underground nuclear weapons testing from 1959 to 1961 (Purtymun and Stoker 1987, ESP 1988). The tests involved high explosives and fissionable material insufficient to produce a nuclear reaction. We established 11 stations in 1972 to monitor surface sediments in drainages adjacent to Area AB (Figure 5-18). We added another station (AB-4A) in 1981 as the surface drainage changed.

3. Radiochemical Analytical Results for Sediments

Table 5-20 shows the results of radiochemical analysis of sediment samples collected in 2000. The table also lists the total propagated one sigma analytical uncertainty and the analysis-specific minimum detectable activity where available. Uranium was analyzed by isotopic methods rather than as total uranium for most samples in 2000; total uranium was calculated from these values using specific activities for each isotope. The sample size for most sediment samples is 100 g. Lower detection limit analysis for plutonium-238 and plutonium-239, -240 in reservoir samples was not done in 2000.

To emphasize values that are detections, Tables 5-21 (river sediments) and 5-22 (reservoir sediments) list radiochemical detections for values that are higher than river or reservoir background levels and identify values that are near or above SALs. Table 5-21 shows all tritium detections regardless of screening levels. Detections are defined as values exceeding both the analytical method detection limit (where available) and three times the individual measurement uncertainty. Qualifier codes are shown because some analytical results that meet the detection criteria are not detections: in some cases, the analyte was found in the lab blank or was below the method detection limit, but the analytical result was reported as the minimum detectable activity. Results from the 2000 sediment sample analysis are generally consistent with historical data.

Because of analytical laboratory delays, many sediment stations did not have results completed for plutonium-238, plutonium-239, -240, and americium-241 in time for the 1999 report; the complete data appear in Table 5-23. As discussed in the 1999 report, the analytical laboratory had data quality problems with analysis of strontium-90 for 1999, so the data are not included in Table 5-23. The report "Environmental Surveillance at Los Alamos during 1999" contained the complete sediment strontium-90 data.

In 1999, strontium-90 was found above fallout levels in all 105 sediment samples where it was detected in samples from the Pajarito Plateau and at regional stations. These high values resulted from problems with a new strontium-90 laboratory technique. Strontium-90 has previously been detected infrequently at most stations. In 2000, strontium-90 was found above background only at Acid Weir below the former TA-45 outfall (a duplicate laboratory analysis detected strontium-90 below background in the sample). We previously used a strontium-90 background value of 0.87 pCi/g (Purtymun et al., 1987). For this report, background levels are 1.02 pCi/g for river sediments and 1.19 pCi/g for reservoir sediments (McLin et al., in preparation).

Cesium-137 was found in many samples at much higher values than previously noted because of the Cerro Grande fire. Several studies (Bitner et al., 2001) have shown that fires concentrate fallout-derived cesium-137 from vegetation into the soil where it is available for redistribution by runoff. Runoff samples taken from upstream of the Laboratory after the fire found cesium-137 levels much above normal (Johansen et al., 2001). Cesium-137 in the suspended sediment portion of the runoff samples discussed in Johansen et al. (2001) was above the sediment SAL. Post-fire sediment samples from several canyons or at stations without previous evidence of radioactive contamination showed high cesium-137 values, some above SALs. These included Water at Rio Grande, Pajarito Retention Pond, Pajarito at Rio Grande, Los Alamos Canyon Reservoir, Rio Grande at Cochiti, Guaje at SR 502, Frijoles at Rio Grande, above Ancho Spring, and Chaquehui at Rio Grande.

For 2000, samples from two stations at Cochiti Reservoir showed cesium-137 at values about 20% to 40% above background. Plutonium-238 was apparently found in one sample well above background, but reanalysis of the sample did not detect any plutonium isotopes. Samples from two locations in Abiquiu Reservoir found plutonium isotopes above background. In one sample, plutonium-238 was found at 15 times the background value. This reservoir is well upstream from Laboratory influence. Gross alpha and beta values at most stations in both Cochiti and Abiquiu Reservoirs were above background. These values may reflect a change in analytical laboratory from previous years.

At regional stations, plutonium isotopes were found above background at Rio Chama at Chamita, Rio Grande at Otowi, and Rio Grande at Bernalillo. Of these four above-background detections, three were not found in analysis of a field duplicate, including apparent detections of both isotopes at Rio Grande at Chamita and of plutonium-239, -240 at Rio Grande at Otowi. The results for plutonium-238 and plutonium-239, -240 at Rio Chama at Chamita were about 40 and 60 times the background (but were not substantiated by analysis of a field duplicate). This location is well upstream from Laboratory influence. Cesium-137 was found in a post-fire sample from the Rio Grande at Cochiti at nearly three times background. Cesium-137 was one of the isotopes found in higher amounts in runoff because of the Cerro Grande fire (Johansen et al., 2001).

Many 2000 sediment samples from the known radioactive effluent release areas in Acid/Pueblo, DP/Los Alamos, and Mortandad Canyons exceeded background levels for tritium, cesium-137, plutonium-238, plutonium-239, -240, americium-241, gross alpha, gross beta, and gross gamma activities. These levels are consistent with historical data.

In both Los Alamos and Pueblo Canyon sediments, above-background levels of plutonium are evident for distances greater than 16 km downstream from the sources in Acid and DP Canyons. The contamination extends off-site across San Ildefonso Pueblo lands and reaches the Rio Grande near the Otowi Bridge. Plutonium-238 and plutonium-239, -240 activities downstream of historical release sites in those canyons have remained relatively constant during the past. These patterns have been documented for several decades in Laboratory reports (ESP 1981).

At station DPS-4 in DP Canyon, activities of americium-241, cesium-137, plutonium-238, and plutonium-239, -240 were above background in 2000, consistent with historical data. In Los Alamos Canyon (extending to Los Alamos at Otowi), activities of americium-241, cesium-137, plutonium-238, and particularly plutonium-239, -240 were above background as in the past. Tritium was detected in sediments at DPS-4, Los Alamos at LAO-1, and Los Alamos at LAO-4.5.

At Acid Weir (at the confluence of Acid and Pueblo Canyons), plutonium-238 was not found above background, which is unusual, and plutonium-239, -240 activity was about 10 times background. The latter value is consistent with historical data.

Plutonium-239, -240 was about 10 times background at Pueblo 1R. In pre-fire samples at Pueblo 2, plutonium-239, -240 activity was 144 times background. Levels above background decrease to 46 times background at Hamilton Bend Spring, 68 times background at Pueblo 3, and, in a post-fire sample, 88 times greater than background at Pueblo at SR 502.

Within Mortandad Canyon, the greatest radionuclide levels in sediments are found between the point where the TA-50 RLWTF effluent enters the drainage (above station Mortandad at GS-1) and the sediment traps (MCO-7), approximately a 3-km distance. Radionuclide levels decrease in the downstream direction from TA-50 to the sediment traps. Radionuclide levels near, or slightly exceeding, background levels are found downstream of the sediment traps, extending to the Laboratory/San Ildefonso Pueblo boundary station A-6. Based on mass spectrometry analysis, Gallaher concluded that off-site plutonium contamination at levels near fallout values might extend two miles beyond the Laboratory boundary (Gallaher et al., 1997).

In 2000, sediment samples from GS-1, MCO-5, and MCO-7 in Mortandad Canyon showed cesium-137 concentrations that were up to 4.4 times greater than the SAL value. Median values since 1980 for cesium-137 at these stations range up to six times greater than the SAL value. Cesium-137 levels at these stations have declined by factors of five to 35 since the early 1980s because of lower cesium-137 discharges from the RLWTF. Tritium in the sediment sample at GS-1 was 16% above the SAL. The plutonium-239, -240 activity at GS-1 was about 73% of the SAL. The americium-241, plutonium-238, and plutonium-239, -240 analyses from MCO-5 were in keeping with most past values, supporting the idea that one of two analyses for these isotopes in 1999 was erroneously high. During 2000, no other sediment samples in Mortandad Canyon showed any values that exceeded SAL values.

Downstream of the sediment traps in Mortandad Canyon at stations MCO-9, MCO-13, A-6, and Mortandad at SR-4 (A9), plutonium-239, -240 activity ranged from 1.3 to 2.6 times background values. Although the data are comparable to previous years, the comparison with background is much higher than given for the last 15 years, reflecting a change in the background value from 0.023 pCi/g to 0.013 pCi/g. Based on the former background value, results at these stations range from 0.7 to 1.5 times background. Other, not yet published, results from these stations based on isotopic ratios support the new smaller background value.

A number of sediment samples in the vicinity and downstream of Area G contained plutonium-238 and plutonium-239, -240 at activities greater than background. Both isotopes were about 35 times background at G-7. G-6R had a plutonium-239, -240 activity more than 18 times background. Americium-241 was 16 times background at G-6 R. Tritium was found at G-4 R-1 and G-4 R-2 above or near the SAL and at G-6R. The station Pajarito at SR 4, which is located more than one km downstream of Area G, had plutonium-239, -240 above background.

We found plutonium-238 and plutonium-239, -240 at activities greater than background in a number of sediment samples collected at Area AB. Station AB-3 is located immediately downstream of a known surface-contamination area dating to 1960 (Purtymun and Stoker 1987). At AB-3, plutonium-239, -240 was again nearly 58 times background, and plutonium-238 was three times background activity. These values are consistent with past results. Although plutonium-239, -240 was found above background in samples at AB-1 and AB-11, analysis of field duplicates did not find this isotope above background.

At Ancho at SR 4, tritium was again detected. The station Above Ancho Spring had tritium above the SAL, as well as above-background cesium-137 and plutonium-239, -240.

Chaquehui at Rio Grande again had a detection of cesium-137 and showed tritium. Potrillo at SR 4, Cañon de Valle at SR 501, Frijoles at Rio Grande, and Fence at SR 4 had detections of plutonium-239, -240 slightly above background.

The remainder of sediment samples collected at locations at the Laboratory in 2000 were near background levels.

4. Nonradiochemical Analytical Results

a. Trace Metals. Beginning in 1992, we have analyzed sediments for trace metals. Table 5-24 presents trace metal results for the sediment samples collected in 2000.

Since 1990, trace metals analysis has indicated the presence of mercury at near detection limit concentrations (0.025 mg/kg) in nearly 200 sediment samples. The largest numbers of those historic samples (from 1990–1998) were from Los Alamos Canyon (22 samples), followed by Mortandad Canyon (21 samples since 1992), Area AB (19 samples), and Area G (15 samples since 1994). In 2000, we found low levels of mercury, far below the SAL of 23 mg/kg, in sediments from Rio Grande at Embudo and Rio Grande at Bernalillo and from Los Alamos at Otowi, MCO-5, Canon de Valle at SR-501, three stations surrounding Area G, and eight stations at Area AB.

Barium and manganese are two metals that may be mobilized by forest fires. Many stations had manganese above SALs, including around Area G and Area AB and samples from Bayo, Guaje, Water, and Los Alamos Canyons. However, much of this sampling occurred before the fire and levels of manganese in 2000 at these stations are in the range of previous values, so the Cerro Grande fire is not the manganese source. Some stations with unusually high manganese (2.5 to 4 times the SAL) were post-fire samples from Frijoles at Rio Grande, Pajarito Retention Pond, and Pajarito at Rio Grande. Barium was near half the SAL at Chaquehui at Rio Grande and exceeded the SAL at Frijoles at Rio Grande, Pajarito at Rio Grande, and Pajarito Retention Pond.

Barium was found at half the SAL at AB-1 and AB-4 in pre-fire samples. A sample collected from AB-1 had unusually high metal content. This sample exceeded SALs for cadmium, chromium, and manganese. A field duplicate collected at AB-1 had metals results in the usual ranges.

b. Organic Analysis. Beginning in 1993, we have analyzed sediments for PCBs and SVOCs. Some sediment samples have been analyzed for HE constituents since 1995. We analyze samples from only a portion of the sediment stations each year. Table 5-25 lists these samples. With exceptions shown in Table 5-26, the analytical results showed no PCBs, SVOCs, or HE constituents detected above the analytical laboratory's reporting limit in any of the sediment samples collected during 2000.

Of the compounds listed in Table 5-26, most were at levels far below ER SALs. Three semivolatile organic compounds were found at Ancho at SR-4 at concentrations that are about 37% to 48% of the EPA Region 6 residential soil screening levels. The compounds are benzo(a)pyrene, benzo(b)fluoranthene, and benzo(a)anthracene. These compounds are polycyclic aromatic hydrocarbon (PAH) compounds that are formed by burning of gasoline, garbage, or animal or plant material and are usually found in smoke and soot. The compounds can come from oil refining and processing of coal, creosote, or tar products or runoff containing grease and oils or asphalt leachate.

5. Long-Term Trends

For the plots discussed in this section, we show only detections of a particular radionuclide in sediments; samples without such detections are not shown.

Figure 5-19a depicts plutonium-238 activities at five stations in Mortandad Canyon from 1976 to 2000. GS-1, MCO-5, and MCO-7 are located downstream of the RLWTF discharge point and upstream of the sediment traps. Plutonium-238 activity at GS-1 has decreased by a factor of about 10 during that time period and, except for a 1999 sample at MCO-5 (which was questionable as a duplicate analysis was in the usual range), has not exceeded the SAL since 1985. MCO-9 and MCO-13 are located downstream of the sediment traps. Plutonium-238 is infrequently above background at those stations and is not regularly detected.

Figure 5-19b shows plutonium-239, -240 levels on Laboratory lands in Mortandad Canyon. Plutonium-239, -240 levels upstream of the sediment traps have declined by approximately a factor of 10 since the 1980s, presumably because of decreased radioactivity in the RLWTF discharges and the dispersal of previously contaminated sediments. Downstream of the sediment traps, plutonium activities have remained relatively constant; the activities are two orders of magnitude less than upstream of the sediment traps and are near background activities.

Figure 5-19c shows that cesium-137 has been present in Mortandad Canyon since the first data collected in the 1970s. Between TA-50 and the sediment traps, cesium-137 levels have often exceeded the SAL but have decreased over the last 25 years. Cesium-137 levels below the sediment traps have gradually declined to near background levels.

F. Groundwater Sampling

1. Introduction

Groundwater resource management and protection efforts at the Laboratory focus on the regional aquifer underlying the region (see Section 1.A.3) but also consider perched groundwater found within canyon alluvium and at intermediate depths above the regional aquifer. The Los Alamos public water supply comes from supply wells drawing water from the regional aquifer.

The early groundwater management efforts by the USGS evolved through the growth of the Laboratory's current Groundwater Protection Management Program, required by DOE Order 5400.1 (DOE 1988). This program addresses environmental monitoring, resource management, aquifer protection, and hydrogeologic investigations. The Laboratory issued formal documentation for the program, the "Groundwater Protection Management Program Plan," in April 1990 and revised it in 1995 (LANL 1996). During 1996, the Laboratory developed and submitted an extended groundwater characterization plan, known as the Hydrogeologic Workplan (LANL 1998), to the NMED. NMED approved the Hydrogeologic Workplan on March 25, 1998. See Chapter 2 for a description of investigations under the Hydrogeologic Workplan.

Concentrations of radionuclides in environmental water samples from the regional aquifer, the perched alluvial groundwater in the canyons, and the intermediate-depth perched systems may be evaluated by comparison with DCGs for ingested water calculated from DOE's public dose limit (see Appendix A for a discussion of standards). The NMWQCC has also established standards for groundwater quality (NMWQCC 1996). Concentrations of radioactivity in drinking water samples from the water supply wells, which draw water from the regional aquifer, are compared with New Mexico Drinking Water Regulations and EPA MCLs or to the DOE DCGs applicable to radioactivity in DOE drinking water systems, which are more restrictive in a few cases.

The concentrations of nonradioactive chemical quality parameters may be evaluated by comparing them with NMWQCC Groundwater Standards (NMWQCC 1996) and with the New Mexico drinking water regulations and EPA drinking water standards, although these latter standards are only directly applicable to the public water supply. Although it is not a source of municipal or industrial water, shallow alluvial groundwater is a source of return flow to surface water and springs used by livestock and wildlife and may be compared with the Standards for Groundwater or the Livestock Watering and Wildlife Habitat Stream Standards established by the NMWQCC (NMWQCC 2000). However, it should be noted that these standards are for the most part based on dissolved concentrations. Many of the results reported here are total concentrations (that is, they include both dissolved and suspended solids concentrations), which may be higher than dissolved concentrations alone.

2. Monitoring Network

Groundwater sampling locations are divided into three principal groups, related to the three modes of groundwater occurrence: the regional aquifer, perched alluvial groundwater in the bottom of some canyons, and localized intermediate-depth perched groundwater systems. Figure 5-20 shows the sampling locations for the regional aquifer and the intermediate-depth perched groundwater systems. Figure 5-21 presents the sampling locations for the canyon alluvial groundwater systems. Purtymun (1995) described the springs and wells.

Sampling locations for the regional aquifer include test wells, supply wells, and springs. New wells, constructed pursuant to implementation of the Hydrogeologic Workplan activities, are not yet part of LANL's Groundwater Monitoring Plan and the monitoring well network. In 2001, the first set of the regional aquifer (R) wells, installed pursuant to implementation of the Hydrogeologic Workplan, will be turned over to ESH-18 for custodianship and possible inclusion in the monitoring network. ESH-18 is working with the NMED and other Laboratory organizations to formulate a protocol for adding these wells to LANL's Groundwater Monitoring Plan to meet site-wide groundwater monitoring needs.

We routinely sample eight deep test wells, completed within the regional aquifer. The USGS drilled these test wells between 1949 and 1960 using the cable tool method. The Laboratory located these test wells where they might detect infiltration of contaminants from areas of effluent disposal operations. These wells penetrate only a few tens or hundreds of feet into the upper part of the regional aquifer. The casings are not cemented, which would seal off surface infiltration along the boreholes.

We collect samples from 12 deep-water supply wells in three well fields that produce water for the Laboratory and community. The wells are part of the Los Alamos water-supply system and are leased and operated by the County of Los Alamos. The well fields include the off-site Guaje well field and the on-site Pajarito and Otowi well fields. The Guaje well field, located northeast of the Laboratory, now contains five producing wells. Four new wells were drilled in this field in 1998. With one exception (G-1A was retained as a backup production well), older wells were retired in 1999 because of their age and declining production. The five wells of the Pajarito well field are located in Sandia and Pajarito Canyons and on mesa tops between those canyons. Two wells make up the Otowi well field, located in Los Alamos and Pueblo Canyons. In 2000, the Laboratory sampled Los Alamos water supply wells for four contaminants of concern: strontium-90, tritium, high explosives, and perchlorate. Additional regional aquifer samples come from wells located on San Ildefonso Pueblo. The frequency of monitoring varies from annual to monthly depending on the contaminant and sampling location.

We sample numerous springs near the Rio Grande because they represent natural discharge from the regional aquifer (Purtymun et al., 1980). As such, the springs serve to detect possible discharge of contaminated groundwater from beneath the Laboratory into the Rio Grande. Based on their chemistry, the springs in White Rock Canyon are divided into four groups, three of which have similar, regional aquifer-related chemical quality. The chemical quality of springs in a fourth group reflects local conditions in the aquifer, probably related to discharge through faults or from volcanics. Sacred Spring is west of the river in lower Los Alamos Canyon.

We sample approximately half of the White Rock Canyon springs each year. Larger springs and springs on San Ildefonso Pueblo lands are sampled annually, with the remainder scheduled for alternate years.

We sample the perched alluvial groundwater in five canyons (Pueblo, Los Alamos, Mortandad, and Pajarito Canyons, and Cañada del Buey) with shallow observation wells to determine the impact of NPDES discharges and past industrial discharges on water quality. In any given year, some of these alluvial observation wells may be dry, and thus we cannot obtain water samples. Observation wells in Water, Fence, and Sandia Canyons have been dry since their installation in 1989. All but two of the wells in Cañada del Buey are generally dry.

Intermediate-depth perched groundwater of limited extent occurs in conglomerates and basalt at depths of several hundred feet beneath the alluvium in portions of Pueblo, Los Alamos, and Sandia Canyons. We obtain samples from two test wells and one spring. The well and spring locations allow us to monitor possible infiltration of effluents beneath Pueblo and Los Alamos Canyons.

Some perched water occurs in volcanics on the flanks of the Jemez Mountains to the west of the Laboratory. This water discharges at several springs (Armstead and American) and yields a significant flow from a gallery in Water Canyon, where this perched water is sampled. Additional perched water extends eastward from the Jemez Mountains beneath TA-16 in the southwestern portion of the Laboratory. The drilling of Hydrogeologic Workplan well R-25 confirmed the existence of this perched water, at a depth of about 750 ft below the mesa top, in 1998. The water was found to contain high-explosives compounds resulting from past Laboratory discharges. The Laboratory is conducting further work to characterize this perched zone.

3. Radiochemical Analytical Results for Groundwater

Table 5-27 lists the results of radiochemical analyses of groundwater samples for 2000. The table also lists the total propagated one sigma analytical uncertainty and the analysis-specific minimum detectable activity where available. Uranium was analyzed by isotopic methods rather than as total uranium for most samples in 2000; total uranium was calculated from these values using specific activities for each isotope.

To emphasize values that are detections, Table 5-28 lists radionuclides detected in groundwater samples. Detections are defined as values exceeding both the analytical method detection limit (where available) and three times the individual measurement uncertainty. Qualifier codes are shown because some analytical results that meet the detection criteria are not detections: in some cases, the analyte was found in the lab blank or was below the method detection limit, but the analytical result was reported as the minimum detectable activity. Because uranium, gross alpha, and gross beta are usually detected, we indicate in Table 5-28 only occurrences of these measurements above threshold values. The specific levels are 5 µg/L for uranium, 5 pCi/L for gross alpha, and 20 pCi/L for gross beta and are lower than the EPA MCLs or screening levels.

The right-hand columns of Table 5-28 indicate radiochemical detections that are greater than one-half of the DOE DCGs for public dose for ingestion of environmental water or the standards shown. No groundwater values exceeded half the DOE public dose DCG values in 2000.

Discussion of results will address the regional aquifer, the perched canyon alluvial groundwater, and the intermediate-depth perched groundwater system.

a. Radiochemical Constituents in the Regional Aquifer. For samples from wells or springs in the regional aquifer, most of the results for radiochemical measurements were below the DOE drinking water DCGs or the EPA or New Mexico standards applicable to a drinking water system. In addition, most of the results were near or below the detection limits of the analytical methods used. The exceptions are discussed below.

The main detected radioactive element in the regional aquifer was uranium, found in springs and wells on San Ildefonso Pueblo land. See Section 5.G for a discussion of these values.

A number of regional aquifer springs and wells had apparent detections of americium-241, plutonium-238, plutonium-239, -240, and other isotopes. In many cases, the analysis of laboratory or field duplicate samples did not support the apparent detections. At values near the detection limit, it is technically difficult to determine whether an analyte has been detected in an individual sample. However, because these measurements are not repeatable, these apparent detections are far more likely to be due to analytical outliers (that is, false positives) than to the presence of the particular isotope in groundwater. Important factors regarding monitoring for radioactivity in groundwater are using detection limits substantially below the drinking water MCL and drawing conclusions based on a large body of data rather than from an individual sample. By observing data trends over time and location, we eliminate false positives potentially associated with any errors arising from chemical analysis or sampling.

Americium-241 was apparently found near the detection limit in Test Well 1, O-1, Spring 3A, and Spring 4A (it was not detected in a duplicate analysis of the Spring 4A sample). Americium-241 has not been regularly found at any of these locations, so it is likely that these results are false positives.

Numerous apparent detections of plutonium isotopes (most near the detection limit) occurred in regional aquifer well and spring waters. None of the apparent detections were supported (and many were contradicted) by analysis of laboratory or field duplicates, which were done for many of the samples. As plutonium isotopes are not regularly found in these waters, it is likely that the results are analytical artifacts. We plan to collect additional samples in 2001 to check for the possibility of plutonium occurrence at these stations. Plutonium-238 was found in Test Well 3 (though not in a duplicate analysis), Sandia Spring, Spring 2, and at San Ildefonso wells LA-5, Pajarito Pump 1 (though not in a duplicate analysis), Don Juan Playhouse, Otowi House, and New Community (though not in a field duplicate). Plutonium-239, -240 was apparently detected in Test Well 3 (though not found in a duplicate analysis) and New Community Well (though not found in a field duplicate).

During 1999 sampling, analytical laboratory problems caused many apparent detections of strontium-90 where it had not been seen previously. Levels of strontium-90 exceeding the drinking water MCL of 8 pCi/L were apparently detected in Test Wells 1, 3, 4, 8, DT-9, DT-10, and Sanchez House Well at San Ildefonso Pueblo. Strontium-90 was also detected in Los Alamos water supply wells G-1, G-1A, O-1, O-4, and PM-4 and San Ildefonso Pueblo water supply wells LA-5, Don Juan Playhouse Well, Pajarito Well (Pump 1), and Eastside Artesian Well. Sacred Spring and Spring 8B also showed strontium-90 detections. LANL believes that none of these 1999 detections are valid and that they are due to analytical laboratory problems. Data collected during 2000 went to outside analytical laboratories, which achieved lower detection limits for strontium-90 analysis. The 2000 data support the conclusion that much of the 1999 strontium-90 data were subject to analytical error.

Regional aquifer test wells were sampled either quarterly or semiannually for strontium-90 in 2000. See Table 5-29. No strontium-90 was detected in these wells.

Strontium-90 was apparently detected in Spring 9A (though not found in a duplicate analysis), Sacred Spring (though not found in a duplicate analysis), and Basalt Spring.

We sampled all Los Alamos water supply wells quarterly for strontium-90 in 2000; this sampling will continue in 2001. Table 5-29 presents the quarterly strontium-90 results for 2000. In 2000, strontium-90 was initially detected in O-1 and G-3A. O-1 is located in lower Pueblo Canyon several miles east-northeast of the Laboratory's main technical area. Although O-1 was constructed in 1990, it did not become operational until 1997. Major water production from the well began in the spring of 2000. G-3A is in Guaje Canyon, on Forest Service land north of Los Alamos. The detection for O-1 occurred in a laboratory duplicate analysis; the original analysis did not yield a detection. Reanalysis of the original samples and subsequent sampling at both wells have not confirmed either of the detections of strontium-90, so we view these detections as analytical outliers.

NMED hydrologists reported in January 2000 that samples taken in June 1999 from the O-1 supply well contained tritium in concentrations of 39.9 pCi/L. LANL found tritium in O-1 in a June 21, 2000, sample at a concentration of 38.3 +/- 1.3 pCi/L. These concentrations are 500 times lower than the federal drinking water standard but are above background concentrations that can be found in groundwater around the Laboratory. We now sample O-1 monthly for tritium. Table 5-30 compiles the water supply well tritium results for 2000. The University of Miami analyzed these samples at a low detection limit of about 1 pCi/L. Tritium was found at background levels in other water supply wells.

Concentrations of tritium in the regional aquifer in other parts of the Laboratory can be found ranging between 1 and 3 pCi/L; tritium concentrations in northern New Mexico surface water and rainwater range from 30 to 40 pCi/L. Tritium also has been seen in the deep aquifer in a test well several hundred yards downstream from the O-1 supply well. The concentration of tritium in Test Well-1 was 360 pCi/L in 1993. The test well just penetrates the top of the regional aquifer about 600 ft beneath the canyon floor. In contrast, the area within the aquifer from which O-1 draws its water begins at just about 1,000 ft below the canyon floor (and about 400 ft lower than the top of the aquifer and Test Well-1) and continues down an additional 1,460 ft.

b. Radiochemical Constituents in Alluvial Groundwater. None of the radionuclide activities in perched alluvial groundwater are above the DOE DCGs for public dose for ingestion of environmental water. Except for americium-241 and strontium-90 values from Mortandad and Los Alamos Canyons, none of the radiochemical measurements exceed DOE DCGs applicable to a drinking water system (that is, exceed 1/25th of the DOE DCGs for public dose for ingestion of environmental water). Levels of tritium; cesium-137; uranium; plutonium-238; plutonium-239, -240; and gross alpha, beta, and gamma are all within the range of values observed in recent years.

In Pueblo Canyon, samples from APCO-1 showed detections of strontium-90 and plutonium-239, -240. This well had plutonium-239, -240 above the detection limit in most years since 1994. We have seen similar values in previous years in surface water and alluvial groundwater in Pueblo Canyon, because of past Laboratory discharges.

The samples of perched alluvial groundwater in Los Alamos and DP Canyons show residual contamination, as we have seen since the original installation of monitoring wells in the 1960s. LAO-C is upstream from known Laboratory sources and showed detections of americium-241, plutonium-238, and strontium-90. This well had one previous detection of americium-241 in 1980 and three previous detections of plutonium-238 during 1973. Strontium-90 was found in LAO-0.7, LAO-2, LAO-3A, and LAO-4. In LAO-1, LAO-2, and LAO-3A, the activity of strontium-90 usually approaches or exceeds the EPA primary drinking water MCL of 8 pCi/L. Plutonium-239, -240 was not detected in LAO-0.7, for the second year since 1993. LAO-2 and LAO-3A showed gross beta activities approaching or exceeding the drinking water screening level of 50 pCi/L.

The perched alluvial groundwater samples from Mortandad Canyon showed activities of radionuclides within the ranges observed previously. Tritium; strontium-90; cesium-137; plutonium-238; plutonium-239, -240; americium-241; and gross alpha, beta, and gamma are usually detected in many of the wells. The radionuclide levels are in general highest nearest to the TA-50 RLWTF outfall at well MCO-3 and decrease down the canyon. The levels of tritium, strontium-90, and gross beta usually exceed EPA drinking water criteria in many of the wells. In some years, the levels (except for tritium) exceed the DOE drinking water system DCGs, but the levels do not exceed the DOE DCGs for public dose for ingestion of environmental water. Tritium in MCO-3 and strontium-90 in MCO-3, MCO-5, and MCO-6 exceeded the EPA MCL. EPA has no drinking water criteria for plutonium-238, plutonium-239, -240, or americium-241. Except for americium-241 in MCO-3, the DOE Drinking Water System DCGs for these latter radionuclides were not exceeded in Mortandad Canyon alluvial groundwater in samples taken in 2000. For MCO-5, MCO-6, and MCO-7, the detections of plutonium-238, plutonium-239, -240, and americium-241 were not always consistent among the samples for a well. For example, in MCO-5 and MCO-7, plutonium-238 was only found in the filtered sample and plutonium-239, -240 only in the unfiltered sample. In MCO-6, plutonium-238 was found in the unfiltered sample but only one of two filtered samples, whereas plutonium-239, -240 was found only in the unfiltered sample.

c. Radiochemical Constituents in Intermediate-Depth Perched Groundwater. In the 1950s, based on measurements of water levels and major inorganic ions, the USGS established that contaminated surface water and perched alluvial groundwater in Pueblo Canyon recharge the intermediate-depth perched zone water that underlies the canyon floor (Weir et al., 1963; Abrahams 1966). Taken over time, the radionuclide activity measurements in samples from Test Well (TW) 1A, TW-2A, and Basalt Spring in Pueblo and Los Alamos Canyons confirm this connection. TW-2A, furthest upstream and closest to the historical discharge area in Acid Canyon, has shown the highest levels. In 2000, we sampled only Basalt Spring and POI-4 (an intermediate-depth well located near TW-1A). Strontium-90 was detected in the Basalt Spring sample. The sample from the Water Canyon Gallery, which lies southwest of the Laboratory, was consistent with previous results, showing no evidence of radionuclides from Los Alamos operations.

4. Nonradiochemical Analytical Results

Table 5-31 lists the results of general chemical analyses of groundwater samples for 2000, and results of trace metal analyses appear in Table 5-32.

a. Nonradiochemical Constituents in the Regional Aquifer. With the exceptions discussed here, values for all parameters measured for environmental surveillance sampling in the water supply wells are within drinking water limits. Separate samples were collected from the public water supply system to determine regulatory compliance with the Safe Drinking Water Act, and these samples were all in compliance for 2000 (see Section 2.B.9).

The test wells in the regional aquifer showed levels of several constituents that approach or exceed standards for drinking water distribution systems. However, it should be noted that the test wells are for monitoring purposes only and are not part of the water supply system. TW-1 had a nitrate value of 5.3 mg/L (nitrate as nitrogen), again below the EPA primary drinking water standard of 10 mg/L. This test well has shown nitrate levels in the range of about 5 to 20 mg/L (nitrate as nitrogen) since the early 1980s. The source of the nitrate might be infiltration from sewage treatment effluent released into Pueblo Canyon or residual nitrates from the now decommissioned TA-45 radioactive liquid waste treatment plant that discharged effluents into upper Pueblo Canyon until 1964. Nitrogen isotope analyses the ER Project made during 1998 indicate that the nitrate is from a sewage source (Nylander et al., 1999).

The average fluoride values since 1951 for TW-4 and since 1960 for TW-8 are about 0.2 mg/L. TW-4 and TW-8 both showed fluoride at 0.88 mg/L, or 55% of the New Mexico groundwater limit. Only a few values near this level were seen in each well during the 1960 to 1964 period, which suggests an analytical laboratory error during that time. The 2000 samples from these wells may also have suffered from a laboratory or sampling error; they were collected on the same date.

Over the past few years, sporadic detections of selenium have apparently occurred in groundwater and surface water samples. The values are near the detection limit and do not occur consistently at a given station. We suspect these results reflect the uncertainties of chemical analysis near the detection limit rather than the presence of selenium. Six groundwater samples and several surface water samples showed an apparent detection of selenium in 1998. Typically, we have not detected selenium in groundwater on the Pajarito Plateau. Selenium was found in Los Alamos Canyon alluvial groundwater and in each of the three DT series test wells at TA-49. We detected no selenium at these sites in 1999, suggesting that the previous year's values, which were close to the detection limit, did not indicate its presence. In 1999, we detected selenium at low levels at Spring 1 and Spring 9. For 2000, selenium was found in regional aquifer samples at TW-2, TW-3, TW-4, Spring 4, Spring 6, and Spring 10 and San Ildefonso wells LA-5 and New Community Well. Selenium was also found in LAO-2, MCO-2, MCO-6, CDBO-6, and one deionized water (DI) blank.

In the last few years, iron, manganese, cadmium, nickel, antimony, and zinc have been high in several of the regional aquifer test wells. Levels of trace metals that approach water quality standards in some of the test wells are believed to be associated with turbidity of samples and with the more than 40-year-old steel casings and pump columns. The lead levels appear to result from flaking of piping installed in the test wells and do not represent lead in solution in the water (ESP 1996). In 2000, iron approached or exceeded the EPA secondary drinking water standard in Test Wells 1, 2, 3, and 4 and exceeded the New Mexico groundwater limit in Test Wells 2 and 4. Manganese approached or exceeded the EPA secondary drinking water standard in Test Wells 1, 2, and 4 and exceeded the New Mexico groundwater limit in Test Well 2. Test Wells 1, 2, and 4 had lead concentrations above the EPA action level, and Test Wells 1, 2, 3, and 4 had antimony concentrations just below the EPA MCL.

Samples collected for metals analysis from most of the White Rock Canyon springs were filtered in 2000. Many of the springs have very low flow rates, and we collected samples in small pools in contact with the surrounding soils. Spring 10 had a manganese concentration exceeding the New Mexico groundwater limit. Except for selenium, none of the springs showed trace metals at levels of concern in 2000.

Perchlorate is a nonradioactive chemical compound containing a chlorine atom bound to four oxygen atoms and is used in a variety of industrial processes. At the Laboratory, perchlorate is a byproduct of the perchloric acid used in nuclear chemistry research. Industrial perchlorate uses also include solid fuels for rockets, high explosives, and fireworks; air-bag inflators; and electroplating, leather tanning, and rubber manufacturing. The EPA has not established a drinking water standard for perchlorate. Perchlorate is on the EPA's contaminant candidate list, which under the Safe Drinking Water Act requires background investigations to determine an MCL. According to an EPA fact sheet, present toxicology information suggests a provisional cleanup level of 4–18 ppb. The State of California, which has perchlorate contamination in drinking water supplies in some areas, has established a perchlorate water-supply action level for concentrations greater than 18 ppb. The State of New Mexico has not established an action level or regulatory standards for perchlorate.

In 2000, surface water and groundwater samples collected by the Environmental Surveillance Program were analyzed for perchlorate. Perchlorate was detected in samples collected during 2000 from the O-1 water-supply well at concentrations of 1.9 to 5 ppb (Table 5-33). The analytical laboratory J-flagged all but one of the analytical results (of 5 ppb), meaning that the results are below the reporting limit and the quantities are estimated. Following the initial discovery, we have sampled O-1 monthly for perchlorate. The chemical was first detected in O-1 in late June during regular sampling that is part of the Laboratory's water quality-assurance activities. Follow-up sampling confirmed its presence. The source of perchlorate may be effluent from the Manhattan Project and early cold-war-era radioactive liquid waste treatment facilities that discharged into Acid Canyon until 1964. Other water supply wells are sampled on a semiannual basis, and none have shown perchlorate in samples.

Perchlorate was also found in Spring 4 at 8.5 ppb. A confirmation sample was collected in 2001, but results are not available. One sample from Test Well 1 showed perchlorate at 2.8 ppb (the analytical laboratory J-flagged the analytical result, meaning that the result was below the reporting limit and the quantity was estimated), but a field duplicate did not detect perchlorate.

b. Nonradiochemical Constituents in Alluvial Groundwater. The canyon bottom perched alluvial groundwater in Pueblo, Los Alamos, and Mortandad Canyons receives effluents. The groundwater shows the effects of those effluents in that values of some constituents are elevated above natural levels.

Many of the Mortandad Canyon alluvial groundwater samples in Table 5-34 had fluoride and nitrate concentrations greater than half the New Mexico groundwater standards. The nitrate source is nitric acid from plutonium processing at TA-55 that enters the TA-50 waste stream. In response to a letter of noncompliance from NMED, in March 1999 the RLWTF instituted a program to restrict the discharge of nitrogenous wastes into the facility's collection system. As shown in Figure 5-22, the nitrate (nitrate as nitrogen) concentration of effluent discharge from the RLWTF after March 1999 has been less than 10 mg/L. The concentration of fluoride in the RLWTF effluent after August 1999 has been less than the 1.6 mg/L standard.

Under the Laboratory's groundwater discharge plan application for the RLWTF, we collected separate samples for nitrate, fluoride, and TDS approximately bimonthly from three alluvial monitoring wells in Mortandad Canyon during 2000: MCO-3, MCO-6, and MCO-7. We reported the analytical results quarterly to the NMED. During 2000, nitrate concentrations in alluvial groundwater wells MCO-3 and MCO-6 were below the New Mexico groundwater standard for nitrate of 10 mg/L (nitrate as nitrogen), as Figure 5-22 shows. The nitrate concentration in MCO-7 has been below the NMWQCC groundwater standard since June 2000. Beginning in June 1999, fluoride concentrations (with the exception of the October 2000 value in MCO-7) at all three wells have been below the NMWQCC groundwater standard for fluoride of 1.6 mg/L, as shown in Figure 5-22.

Six groundwater samples and several surface water samples showed an apparent detection of selenium in 1998. Typically, we have not detected selenium in groundwater on the Pajarito Plateau. For 2000, selenium was found in LAO-2, MCO-2, MCO-6, CDBO-6, and one DI Blank.

LAO-2 continued to show levels of molybdenum just below the New Mexico groundwater limit, and LAO-3A had molybdenum well above the limit. LAO-2 and LAO-3A had beryllium above the EPA drinking water MCL, and MCO-2 had a value below the MCL.

The Cerro Grande fire caused high manganese, aluminum, and iron concentrations in many surface water and shallow alluvial perched groundwater samples. Higher than usual manganese concentrations were also found in APCO-1, LAO-C, and MCO-2. These concentrations exceeded the New Mexico groundwater limit by factors of four to 12. Iron levels in APCO-1, MCO-2, and MCO-7.5 were above the New Mexico groundwater limit. LAO-2, LAO-3A, and CDBO-6 had iron values just below half the New Mexico groundwater limit. LAO-2, LAO-3A, and MCO-7.5 had aluminum values that were about 20% of the New Mexico limits for use as irrigation water.

Perchlorate was detected in groundwater at MCO-3, MCO-5, MCO-6, MCO-7, and MCO-7.5. Perchlorate concentrations ranged from 33 ppb to 400 ppb (see Table 5-34). The perchlorate source is discharges from the TA-50 RLWTF, which processes waste water from analytical chemistry facilities that perform actinide chemistry.

c. Nonradiochemical Constituents in Intermediate-Depth Perched Groundwater. In 2000, the nitrate value for Basalt Spring was 160% of the NMWQCC groundwater and EPA drinking water standards. The source of the nitrate is infiltration of contaminated surface water and shallow groundwater from Pueblo Canyon. Basalt Spring had a low concentration of selenium. Otherwise, the intermediate-depth perched groundwater samples from Basalt Spring, POI-4 in lower Pueblo Canyon, and the Water Canyon gallery did not show any concentrations of nonradiochemical constituents that are of concern.

d. Organic Constituents in Groundwater. We performed analyses for organic constituents on selected springs and test wells in 2000. The stations sampled appear in Table 5-35. Some samples were analyzed for VOCs, SVOCs, and PCBs. We analyzed water supply wells, test wells, and most springs for HE constituents. No HE constituents were found above the analytical laboratory's reporting limit in the groundwater samples listed in Table 5-35. We rejected most of the possible organic detections reported by the analytical laboratory because the compounds were either detected in method blanks (that is, they were introduced during laboratory analysis) or detected in trip blanks. Trip blanks go along during sampling to determine if organic constituents come from sample transportation and shipment. Table 5-36 shows organic compounds detected above the analytical laboratory's reporting level in 2000, as well as results from blanks. Most of the compounds detected were also found in accompanying blanks. The exceptions are the finding of Aroclor-1260 and benzoic acid at Test Well 4; methyl-2-pentanone[4-] and butanone [2-] at LAO-0.7; and toluene in Spring 10. Toluene is often found as a result of contamination during analytical laboratory organic analysis.

In 1998, drilling of characterization well R-25 at TA-16 in the southwest portion of the Laboratory revealed the presence of HE constituents at concentrations above the EPA Health Advisory guidance values for drinking water. Consequently, the Laboratory tested all nearby water supply wells for these compounds. None of the analytical laboratories detected any HE or their degradation products in any of the water samples from any of the supply wells sampled. We sample all water supply wells annually for HE compounds. The three wells nearest to TA-16 (PM-2, PM-4, and PM-5) are sampled quarterly. PM-2, 4, and 5 are closest to R-25 where HE was found in groundwater in 1998. We did not find HE in any of the water supply well samples in 2000.

5. Long-Term Trends

a. Regional Aquifer. The long-term trends of water quality in the regional aquifer have shown limited impact resulting from Laboratory operations. As noted above, in 1998, drilling characterization well R-25 at TA-16 in the southwest portion of the Laboratory revealed the presence of HE constituents. No HE constituents have been found in water supply wells. The extent of high explosives in the regional aquifer is presently unknown. The Laboratory is working in cooperation with regulatory agencies to define the extent of the contamination and ensure that drinking water supplies are adequately protected.

Aside from naturally occurring uranium, the only radionuclide we consistently detected in water samples from production wells or test wells within the regional aquifer is tritium, which is found at trace levels. We have found tritium contamination at four locations in Los Alamos and Pueblo Canyons and one location in Mortandad Canyon. The tritium levels measured range from less than 2% to less than 0.01% of current drinking water standards, and all are below levels detectable by the EPA-specified analytical methods normally used to determine compliance with drinking water regulations. Tritium at about 40 pCi/L was found in water supply well O-1. Other measurements of radionuclides above detection limits in the regional aquifer reflect occasional analytical outliers not confirmed by analysis of subsequent samples.

Nitrate concentrations in TW-1 have been near the EPA MCL since 1980. The source of the nitrate might be infiltration of sewage-effluent-contaminated shallow groundwater and surface water in Pueblo Canyon or residual nitrates from the now decommissioned radioactive liquid waste treatment plants that discharged effluents into upper Pueblo Canyon until 1964. Perchlorate is present in water supply well O-1 at concentrations up to 5 ppb, compared to provisional drinking water limits of 18 ppb. The source of the perchlorate might be residual perchlorate from the now decommissioned radioactive liquid waste treatment plants that discharged effluents into upper Pueblo Canyon until 1964.

b. Surface Water and Alluvial Groundwater in Mortandad Canyon. Figure 5-23 depicts long-term trends of radionuclide concentrations in surface water and shallow perched alluvial groundwater in Mortandad Canyon downstream from the outfall for the RLWTF at TA-50. Because of strong adsorption to sediments, cesium-137 is not detected in groundwater samples. The figure only shows radionuclide detections. If more than one sample was collected in a year, the average value for the year is plotted. The surface water samples are from the station Mortandad at GS-1, a short distance downstream of the TA-50 effluent discharge. Radioactivity levels at this station vary daily depending on whether individual samples are collected shortly after a release from the RLWTF. These samples also vary in response to changes in amount of runoff from other sources in the drainage. The groundwater samples are from observation well MCO-5 in the middle reach of the canyon. Groundwater radioactivity at MCO-5 is more stable than at Mortandad at GS-1 because groundwater responds more slowly to variations in runoff water quality.

Chemical reactions such as adsorption do not delay tritium transport, and high tritium activities are found throughout the groundwater within the Mortandad Canyon alluvium. The tritium level in MCO-5 in 2000 was below the EPA MCL of 20,000 pCi/L, whereas that at Mortandad at GS-1 was above the MCL. The surface water tritium activity at Mortandad at GS-1 reflects diluted values of effluent from TA-50 as the effluent mixes with other stream water. The tritium activity at MCO-5 has fluctuated almost in direct response (with a time lag of about one year) to the average annual activity of tritium in the TA-50 outfall effluent. Tritium values at both stations have decreased since the mid-1980s because of decreased tritium content of the TA-50 effluent.

For all but four years between 1973 and 1999, the americium-241 activity of RLWTF discharges exceeded the DOE DCG for public dose of 30 pCi/L. Americium-241 activity has not been measured regularly at monitoring stations in Mortandad Canyon. Under many environmental conditions, americium is less strongly adsorbed than cesium or strontium and moves more readily in groundwater. Except for MCO-3, americium-241 activity in the shallow alluvial groundwater in 2000 was below the DOE drinking water DCG of 1.2 pCi/L. Americium-241 at Mortandad at GS-1 showed an increase in activity to near the DOE DCG for public dose from 1995 to 1998 but decreased in 1999 and 2000. At MCO-5, the americium-241 activity showed only a slight increase from 1995 to 1998 and a decline over the past few years.

In 2000, we detected strontium-90 in surface water at Mortandad at GS-1 and in all shallow perched alluvial groundwater observation wells upstream of and including MCO-7, as well as at MCO-2 upstream of the TA-50 outfall. The activities at many wells remain at values in the range of the EPA drinking water standard (8 pCi/L) and the DOE DCG for a DOE-maintained drinking water system (40 pCi/L) and range up to 60 pCi/L. Strontium-90 has previously been detected only once downstream of MCO-6B (or MCO-6), in MCO-8 in 1976. It appears that strontium-90 has been retained by adsorption or mineral precipitation within the upstream portion of the alluvium. The level of strontium-90 has risen gradually at downstream wells MCO-5 and MCO-6 over the last 20 years suggesting that the mass of the radionuclide is moving slowly downstream.

We detected plutonium isotopes at Mortandad at GS-1, MCO-3, MCO-5, MCO-6, and MCO-7.5 in 2000. Both isotopes have been detected at Mortandad at GS-1 and MCO-3 at levels near the DOE public dose DCGs (30 pCi/L for plutonium-239, -240 and 40 pCi/L for plutonium-238) over the past few years. Values at other alluvial observation wells except for MCO-4 and MCO-7.5 have been near the detection limit in the 1990s. Plutonium has in general been detected in all alluvial observation wells in Mortandad Canyon but appears to be decreasing in activity at downstream locations.

G. Groundwater and Sediment Sampling at San Ildefonso Pueblo

To document the potential impact of Laboratory operations on lands belonging to San Ildefonso Pueblo, DOE entered into a Memorandum of Understanding (MOU) with the Pueblo and the Bureau of Indian Affairs in 1987 to conduct environmental sampling on pueblo land. This section deals with hydrologic and sediment sampling. Figures 5-24 and 5-25 show the groundwater, surface water, and sediment stations sampled on San Ildefonso Pueblo. Aside from stations shown on those figures, the MOU also specifies collection and analysis of additional water and sediment samples from sites that have long been included in the Laboratory's Environmental Surveillance Program, as well as special sampling of storm runoff in Los Alamos Canyon. These locations appear in Figures 5-3, 5-4, 5-6, 5-7, and 5-17. We discuss the results of these analyses in previous sections.

1. Groundwater

Table 5-27 lists the results of radiochemical analyses of groundwater samples for 2000. The table also lists the total propagated one sigma analytical uncertainty and the analysis-specific minimum detectable activity where available. Uranium was analyzed by isotopic methods rather than as total uranium for most samples in 2000; total uranium was calculated from these values using specific activities for each isotope.

To emphasize values that are detections, Table 5-28 lists radionuclides detected in groundwater samples. Detections are defined as values exceeding both the analytical method detection limit (where available) and three times the individual measurement uncertainty. Qualifier codes are shown because some analytical results that meet the detection criteria are not detections: in some cases, the analyte was found in the lab blank or was below the method detection limit, but the analytical result was reported as the minimum detectable activity. Because uranium, gross alpha, and gross beta are usually detected, we indicate in Table 5-28 only occurrences of these measurements above threshold values. The specific levels are 5 µg/L for uranium, 5 pCi/L for gross alpha, and 20 pCi/L for gross beta and are lower than the EPA MCLs or screening levels.

The right-hand columns of Table 5-28 indicate radiochemical detections that are greater than one-half the DOE DCGs for public dose for ingestion of environmental water or the standards shown. No groundwater values exceeded half the DOE public dose DCG values in 2000.

See Section 5.F for a discussion of most of the groundwater stations (wells and springs) listed in the MOU. The present section focuses on the San Ildefonso Pueblo water supply wells.

Numerous apparent detections of plutonium isotopes (most near the detection limit) occurred in regional aquifer well and spring waters. Analysis of laboratory or field duplicates, which was done for many of the samples, did not support any of the apparent detections (and contradicted many of them). As plutonium isotopes are not regularly found in these waters, it is likely that the results are analytical artifacts. We plan to collect additional samples in 2001 to check for the possibility of plutonium occurrence at these stations. Plutonium-238 was found in Test Well 3 (though not in a duplicate analysis), Sandia Spring, and Spring 2 and at San Ildefonso wells LA-5, Pajarito Well Pump 1 (though not in a duplicate analysis), Don Juan Playhouse, Otowi House, and New Community (though not in a field duplicate). Plutonium-239, -240 was apparently detected in Test Well 3 (though not found in a duplicate analysis) and New Community Well (though not found in a field duplicate).

As in previous years, the groundwater data for San Ildefonso Pueblo indicate the widespread presence of naturally occurring uranium at levels approaching or in excess of the EPA drinking water limit. Naturally occurring uranium concentrations near the EPA MCL of 30 µg/L are prevalent in well water throughout the Pojoaque area and San Ildefonso Pueblo. The high gross alpha readings for these wells are related to uranium occurrence.

In 2000, New Community well had the highest total uranium, with values of 28.9 µg/L and 25.5 µg/L found in duplicate analyses. Uranium concentrations at the Don Juan Playhouse and Sanchez House Wells and Pajarito Well Pump 1 were about 25% of the standard. These measurements are consistent with the levels in previous samples and with the relatively high levels of naturally occurring uranium in other wells and springs in the area.

The usual gross alpha levels in these wells are attributable to the presence of uranium. The gross alpha values in some wells were above the EPA primary drinking water standard of 15 pCi/L but were not detections because of high analytical uncertainties. This standard applies to gross alpha from radionuclides other than radon and uranium. Eastside Artesian well had a gross alpha value of 187 pCi/L, which is far larger than prior values and not supported by analysis of other radionuclides. The value is probably the result of analytical laboratory error, but we could not confirm this by the time of this report.

During the 1999 sampling, analytical laboratory problems caused many apparent detections of strontium-90 where it had not been seen previously. Levels of strontium-90 exceeding the drinking water MCL of 8 pCi/L were apparently detected in Test Wells 1, 3, 4, 8, DT-9, DT-10, and Sanchez House Well at San Ildefonso Pueblo. Strontium-90 was also detected in Los Alamos water supply wells G-1, G-1A, O-1, O-4, and PM-4 and San Ildefonso Pueblo water supply wells LA-5, Don Juan Playhouse Well, Pajarito Well Pump 1, and Eastside Artesian Well. Sacred Spring and Spring 8B also showed strontium-90 detections. LANL believes that none of these 1999 detections are valid and that they are due to analytical laboratory problems. We sent data collected during 2000 to outside analytical laboratories, which achieved lower detection limits for strontium-90 analysis. The 2000 data support the conclusion that much of the 1999 strontium-90 data were subject to analytical error; no strontium-90 was detected in any of these wells.

The chemical quality of the groundwater, shown in Table 5-31, is consistent with previous observations. The sample from the Pajarito Well Pump 1 exceeded the drinking water standard for total dissolved solids; this level is similar to those previously measured. This well also has a chloride concentration at 60% of the New Mexico groundwater limit.

Perchlorate is a nonradioactive chemical compound containing a chlorine atom bound to four oxygen atoms and is used in a variety of industrial processes. At the Laboratory, perchlorate is a byproduct of the perchloric acid used in nuclear chemistry research. Industrial perchlorate uses also include solid fuels for rockets, high explosives, and fireworks; air-bag inflators; and electroplating, leather tanning, and rubber manufacturing. The EPA has not established a drinking water standard for perchlorate. Perchlorate is on the EPA's contaminant candidate list, which under the Safe Drinking Water Act requires background investigations to determine an MCL. An EPA fact sheet indicates that present toxicology information suggests a provisional cleanup level of 4–18 ppb. The State of California, which has perchlorate contamination in drinking water supplies in some areas, has established a perchlorate water-supply action level for concentrations greater than 18 ppb. The State of New Mexico has not established an action level or regulatory standards for perchlorate. In 2000, the Environmental Surveillance Program collected surface water and groundwater samples for perchlorate analysis.

One sample from New Community Well showed perchlorate at 1.7 ppb (the analytical laboratory J-flagged the analytical result, meaning that the result was below the reporting limit and the quantity was estimated), but a field duplicate did not detect perchlorate. Perchlorate was found at 2.4 ppb in Pajarito Well Pump 1, but the analytical laboratory J-flagged the result.

The fluoride values for some wells (Eastside Artesian and Sanchez House) are near the NMWQCC groundwater standard of 1.6 mg/L, similar to previous values. Several of the wells (Eastside Artesian and Don Juan Playhouse) have alkaline pH values above the EPA secondary standard range of 6.8 to 8.5; these values do not represent a change from those previously observed in the area.

Many of the wells have sodium values significantly above the EPA health advisory limit of 20 mg/L. The values from Pajarito Well Pump 1, Sanchez House, and Eastside Artesian Wells are especially high.

Table 5-32 shows trace metal analyses. The boron value in Pajarito Well Pump 1 was nearly twice the NMWQCC groundwater limit of 750 µg/L. This value was similar to those of past years. Wells LA-5 and New Community Well had detectable selenium. Silver in the Sanchez House well was 90% of the New Mexico groundwater limit.

2. Sediments

We collected sediments from San Ildefonso Pueblo lands in Mortandad Canyon in 2000 from several stations. The results of radiochemical analysis of sediment samples collected in 2000 appear in Table 5-20. The table also lists the total propagated one sigma analytical uncertainty and the analysis-specific minimum detectable activity where available. Uranium was analyzed by isotopic methods rather than as total uranium for most samples in 2000; total uranium was calculated from these values using specific activities for each isotope.

To emphasize values that are detections, Tables 5-21 (river sediments) and 5-22 (reservoir sediments) list radiochemical detections for values that are higher than river or reservoir background levels and identify values that are near or above SALs. Table 5-21 shows all tritium detections regardless of screening levels. Detections are defined as values exceeding both the analytical method detection limit (where available) and three times the individual measurement uncertainty. Lab qualifier codes are shown because some analytical results that meet the detection criteria are not detections: in some cases, the analyte was found in the lab blank or was below the method detection limit, but the analytical result was reported as the minimum detectable activity. Results from the 2000 sediment sample analysis are generally consistent with historical data.

Downstream of the sediment traps in Mortandad Canyon at stations MCO-9, MCO-13, A-6, and Mortandad at SR-4 (A9), plutonium-239, -240 activity ranged from 1.3 to 2.6 times background values. Although the data are comparable to previous years, the comparison with background is much higher than given for the last 15 years, reflecting a change in the background value from 0.023 pCi/g to 0.013 pCi/g. Based on the former background value, results at these stations range from 0.7 to 1.5 times background. Other, not yet published, results from these stations based on isotopic ratios support the new smaller background value.

Sediments from the sampling station located on San Ildefonso Pueblo lands at Los Alamos at Otowi showed the activity of plutonium-239, -240 at 13 times background. This value is within the range of previous measurements at this station.

H. Sampling Procedures, Analytical Procedures, Data Management, and Quality Assurance

1. Sampling

The Draft Quality Assurance Project Plan (ESH-18 1996) is the basic document covering sampling procedures and quality assurance (QA). All sampling is conducted using strict chain-of-custody procedures, as described in Gallaher (1993). The completed chain-of-custody form serves as an analytical request form and includes the requester or owner, sample barcode number, program code, date and time of sample collection, total number of bottles, the list of analytes to be measured, and the bottle sizes and preservatives for each analysis required. In 2000, we sent samples to the Laboratory's Chemical Science and Technology (CST) Division and to two commercial analytical laboratories, Paragon Analytics, Inc. (Paragon), and General Engineering Laboratories (GEL). CST followed the detailed analytical methods published in Gautier (1995). Paragon and GEL were instructed to follow the Model Statement of Work for Analytical Laboratories (SOW) that was prepared for the DOE Albuquerque Operations Office (AQA 2000). An addendum describing specific requirements and guidelines for analysis of runoff, industrial wastewater, surface water, groundwater, and sediment samples accompanied the SOW. Paragon and GEL were audited against the SOW using procedures that were developed by the DOE-AL Analytical Management Program and are described in AGRA (1998). Paragon and GEL were awarded contracts only after they demonstrated that they met the requirements described in the SOW.

The "F/UF" column on the tables of analytical results shows a "UF" for nonfiltered samples and an "F" for samples that were filtered through a 0.45-micron filter. We field filtered radionuclide and metals samples collected at the White Rock Canyon Springs to minimize the effects of surface soils and to represent groundwater surfacing at the springs. We also field filtered surface water samples that were collected for metals analysis. This procedure allows for comparison of analytical results with the NMWQCC standards. These standards are mainly for dissolved concentrations, except mercury and selenium, for which standards are based on total concentrations. Mercury and selenium were not filtered in the field and were analyzed to determine total concentration.

Automated samplers located at recently installed gaging stations (Shaull et al., 2000) collected runoff. The contents of bottles the automated samplers collected were first transferred to a churn splitter. That apparatus agitates the samples to ensure that they are well mixed and that the sediments are suspended. If the automated sampler collected an adequate volume of water, we submitted two sets of samples to the analytical laboratory. One set was unfiltered, preserved, and submitted for total analyte concentration analysis. The other set was filtered, preserved, and submitted for dissolved analyte analysis. If there was insufficient volume, only unfiltered samples were analyzed.

2. Analytical Procedures

a. Metals and Major Chemical Constituents. Runoff samples, surface water, and fire-related runoff samples are analyzed by methods consistent with 40 CFR 136.3. Groundwater samples and sediments are analyzed using EPA SW-846 methods.

b. Radionuclides. Radiochemical analysis is performed using methods as updated in Gautier (1995) or described in the SOW. Radiological detection limits are calculated according to the equations in the SOW. Sources of uncertainty that are included in the total propagated uncertainty associated with radiological results include both counting uncertainties and sample preparation (measurement) contributors.

We field preserve water samples for radiochemical analyses with nitric acid to a pH of 2 or less. Before 1996, the analytical laboratories filtered the preserved water samples. Samples collected in 1996 and after were preserved in the field as before but were not filtered by the laboratories. We collect a separate, unpreserved sample for tritium analysis.

When trace-level tritium analyses are required, we ship samples to the University of Miami Tritium Laboratory. These samples are collected and analyzed according to procedures described in Tritium Laboratory (1996).

Negative values are sometimes reported in radiological measurements. Negative numbers occur because radiochemistry counting instrument backgrounds must be subtracted to obtain net counts. Because of slight background fluctuations, individual values for samples containing little or no activity can be positive or negative numbers. Although negative values do not represent a physical reality, we report them as they are received from the analytical laboratory. Valid long-term averages can be obtained only if negative values are included in the analytical results.

c. Organic Compounds. See Table A-9 for organic methods and analytes of groundwater and sediments analysis. Tables A-10 through A-13 list the specific compounds that are analyzed in each suite. All samples we submit for organic chemistry analyses are collected in brown glass bottles, and the aqueous VOC samples are preserved with hydrochloric acid. A trip blank or field blank always accompanies the VOC samples. In addition, most analytical methods require the analysis of laboratory-prepared method blanks or instrument blanks with each batch of samples. Organic target analytes that are detected in these blanks indicate contamination from the sampling or analytical environments. Certain organic compounds used in analytical laboratories are frequently detected in blanks. That is, contamination introduced by the laboratories is common for these compounds. These compounds include acetone, methylene chloride, toluene, 2-butanone, di-n-butyl phthalate, di-n-octyl phthalate, and bis(2-ethylhexyl)phthalate (Fetter 1993).

3. Data Management and Quality Assurance

a. Data Management. Analytical laboratories submit analytical results to ESH-18 both electronically and in paper report form. The status of analyses is tracked with an internal database, and final analytical results are also stored in a database. New analytical data are validated according to the specifications of the DOE-AL Model Data Validation Procedure (AQA 2001). The ESH-18 technical representative performs technical oversight of analytical laboratories, with the assistance of the DOE-AL Analytical Management Program.

b. Quality Assurance. The SOW for analytical chemistry gives detailed requirements for the content of subcontract laboratory QA plans. That SOW also describes the exact requirements for handling ESH-18 samples, from initial sample receipt to the final data report. All of the applicable requirements for batch quality control (QC), which may include method blanks, matrix spikes, laboratory control samples, calibration verifications, detection limit verifications, etc., are discussed in that document.

In addition to batch QC performed by laboratories, ESH-18 submits occasional performance evaluation (PE) samples to test analytical laboratory proficiency and spot check for analytical problems. These PE samples include blanks and samples spiked with known amounts of analyte (knowns). Also, field quality control samples often include field duplicates.

Tables 5-37 through 5-39 present the radiochemical analytical results for the blanks and knowns. Tables 5-40 and 5-41 present the analytical results for the blanks and knowns submitted for metals analysis. The analytical result tables present the analytical results for the field duplicates. No PE samples were submitted for sediment analyses because soil PE samples are easily recognized by the laboratories. Similarly, PE samples are easily distinguishable from runoff, so we don’t send PE samples with runoff samples.

The analytical laboratories ESH-18 used in 2000 participated in the DOE Quality Assessment Program (QAP), which is an external, independent, performance evaluation program. The QAP is designed to test the quality of the environmental measurements that its contractor laboratories report to DOE. The Environmental Measurements Laboratory (EML) administers the QAP for the DOE Office of Environmental Management (EM). The QAP meets the requirements of DOE Order 414.1A, which requires DOE facilities to substantiate, by an external assessment, the quality of radiochemical analyses by their subcontract analytical laboratories. The QAP Web site describes the history and objectives of the program in detail (*http://www.eml.doe.gov/qap*).

The Mixed Analyte Performance Evaluation Program (MAPEP) is another external, independent program that includes radionuclides and hazardous waste contaminants that are covered by the Resource Conservation and Recovery Act (RCRA).

The SOW for analytical chemistry laboratories requires contributing laboratories to participate in both the QAP and MAPEP. Results from these DOE PE programs are categorized as acceptable (result within the two-sigma acceptance range), acceptable with warning (result within the three-sigma acceptance range), and not acceptable (result outside the three-sigma acceptance range). The laboratories initiate internal corrective actions when PE results are categorized as not acceptable, and those corrective actions are spot checked during various laboratory oversight activities. Tables 5-42 through 5-48 give the

QAP results for each laboratory. Tables 5-49 through 5-54 give the MAPEP results for each laboratory.

PE Sample Results Summaries for Analytical Laboratories

Paragon Analytics

ESH-18 submitted both spiked and blank PE samples to Paragon for strontium-90 analysis (see Table 5-37). All of the results obtained were acceptable.

Paragon scored an acceptable with warning for stronium-90 in water in QAP 52 (see Table 5-43) and an acceptable with warning for selenium in soils in MAPEP-00-S7 (see Table 5-52). All other year 2000 QAP (Tables 5-42–5-44) and MAPEP results (Tables 5-49 and 5-52) for relevant analytes were rated as acceptable.

Paragon analyzed our strontium-90 samples for all matrices. The only other samples we submitted to Paragon were runoff samples. Because QA samples contain no suspended solids, the analytical laboratories would clearly recognized them as QA samples. For this reason, we do not submit spikes or DI blanks to the laboratories with runoff samples.

General Engineering Laboratories

ESH-18 submitted both blank and spiked PE water samples to GEL (see Tables 5-38 and 5-40). The spiked samples included tritium, strontium-90, plutonium-238, plutonium-239, and americium-241. All reported analytical results for the blanks were acceptable. All of the spiked sample results were acceptable or acceptable with warning except for one mercury, one tritium, and one strontium-90.

The unacceptable mercury result was less than the detection limit. However, GEL observed during sample login that the pH of the sample was neutral (7). Mercury will not stay in solution at neutral pH, and analysis of such a compromised water sample is expected to yield extremely low results. Results for improperly preserved samples are not considered in our evaluation and need not initiate corrective action.

For the tritium and strontium-90 results that were not acceptable, no errors in the analytical work could be found and the bracketing PE (see Tables 5-45 through 5-47) results for like matrices were acceptable.

The strontium-90 sample was submitted in September of 2000. The expected value for that sample was 5 pCi/L, and the analytical result was less than the detection limit. Review of the corresponding batch QC showed that all of the QC sample results passed the applicable acceptance criteria. In addition, review of the DOE QAP results for water samples submitted in GEL's QAP rounds 51, 52, and 53 (bracketing the analysis in question) showed that acceptable results were obtained in all cases. Also, review of analysis of PE samples from Environmental Resource Associates (a nationally certified PE provider) for August 2000 and October 2000 (see Tables 5-45 through 5-47) (bracketing the analysis in question) showed acceptable PE results for strontium-90. It is likely in this case that an error in preparation of the PE sample, not an analytical error, was the root cause of the PE sample failure. The preparing laboratory (CST) did not perform any analyses to verify correct preparation; therefore, no corroborating analytical data exist.

We also submitted the tritium sample in September of 2000. The expected value for that sample was 10,000 pCi/L, and the analytical result was less than the detection limit. Review of the corresponding batch QC showed that all of the QC sample results passed the applicable acceptance criteria. In addition, review of the DOE QAP results for water samples submitted in QAP rounds 51, 52, and 53 (bracketing the analysis in question) showed that acceptable results were obtained in all cases (see Tables 5-45 through 5-47). It is likely in this case that an error in preparation of the PE sample, not an analytical error, was the root cause of the PE sample failure. The preparing laboratory (CST) did not perform any analyses to verify correct preparation; therefore, no corroborating analytical data exist.

GEL analyzed two QAP aqueous radionuclide samples in 2000. GEL scored an acceptable with warning in QAP 52 for americium-241 and plutonium-239, -240 (Table 5-46). The laboratory scored a not acceptable for plutonium-238. However, GEL scored acceptable for this parameter in both QAP 51 (Table 5-45) and QAP 53 (Table 5-47). QAP 53 also reports that GEL received acceptable scores for amercium-241 and plutonium-239, -240. In that round, the uranium-234 and uranium-238 analyses were scored at acceptable with warning.

Analysis of QAP soils reported in QAP 52 (Table 5-46) indicate that acceptable scores were achieved for all radionuclides except plutonium-239, -240 and strontium-90. GEL received acceptable with warning for plutonium-239, -240 and stronium-90. Soils analyses reported in QAP 53 (Table 5-47) show that GEL received acceptable with warning for thorium-234, uranium-234, and uranium-235. All other analyses were evaluated as acceptable. The MAPEP-00-S7 strontium-90 result was scored as not acceptable (see Table 5-53). GEL received acceptable evaluations for the other radionuclides mentioned above. GEL also received acceptable evaluations for the reported metals and organic compounds.

CST

ESH-18 did not request any strontium-90 analysis from CST in 2000.

ESH-18 submitted blank and spiked PE water samples to CST for radiochemistry analysis (see Table 5-39). The spiked samples included tritium, plutonium-238, plutonium-239, -240, and americium-241. The blank analysis results were all acceptable. A low-level detection for isotopic uranium was reported, but the associated two-sigma uncertainty window encompasses zero. We also submitted additional samples spiked with tritium, plutonium-238, plutonium-239, -240, and americium-241 to CST. All the results were acceptable, except for one americium-241 result that was acceptable with warning.

Blind PE blank and spiked water samples were submitted to CST for metals analyses (see Table 5-41). The spiked samples contained silver, barium, mercury, and lead. Several of the results obtained in the spikes and blanks fell outside the acceptable range. CST reported detections of barium, zinc, and strontium in two of the PE blanks. The spiked samples associated with the blanks showed less than the detection limit for zinc and strontium. The associated spiked sample was spiked with barium and had acceptable recovery. All of the rest of the detections in the blind PE samples CST analyzed were less than 2 times the MDL (the reporting limit for CST) and less than the quantitation limit.

MAPEP-99-W7 (Table 5-51) reports that CST received not acceptable scores for strontium-90, uranium-234, and uranium-238 in waters. On MAPEP-00-S7 (Table 5-54), CST received not acceptable scores for analysis of plutonium-238 and plutonium-239, -240 in soils.

Analytical Detections

For low-level radiochemical results, data are qualified based upon total propagated uncertainties and the proximity to the detection limits

Radiological detection limits are sample specific and are based on Currie's formula (Currie 1968) and are reported in the tables. The laboratories have determined detection limits for each of the other analytical methods. In deriving the detection limits, the laboratories included the average uncertainties associated with the entire analytical method. Sources of error considered include average counting uncertainties, sample preparation effects, digestion, dilutions, gravimetric and pipetting uncertainties, and spike recoveries.

Although these method detection limits determined by the analytical laboratories give an idea of the average limit of detection for a particular measurement technique, the detection limits do not apply to each individual sample measurement (except for radiological analysis). Instead, the question of whether or not an individual measurement is a detection is evaluated in light of its individual measurement uncertainty. For radiochemical analytical results, the analytical uncertainties are reported in the tables. These uncertainties represent a one standard deviation (one sigma) propagated uncertainty. "It is virtually unanimously accepted that an analyte should be reported as present when it is measured at a concentration three-sigma or more above the corresponding method blank" (Keith 1991). We report radiochemical detections as values greater than three times the reported uncertainty. For sediments, the values reported as detections in the table are also above-background levels determined for fallout (or natural background levels in the case of uranium).

The limit of quantification or LOQ is the level where the concentration of an analyte can be quantified with confidence. Again according to Keith (1991), "When the analyte signal is 10 or more times larger than the standard deviation of the measurements, there is a 99% probability that the true concentration of the analyte is ±30% of the calculated concentration." Thus, measured values near the detection limit or less than 10 times the analytical uncertainty do not provide a reliable indication of the amount present. The importance of this number is demonstrated when analytical results are compared against standards; the analytical result should be greater than 10 times the analytical uncertainty for the comparison to be meaningful.

I. Unplanned Releases

1. Radioactive Liquid Materials

No unplanned radioactive liquid releases occurred in 2000.

2. Nonradioactive Liquid Materials

There were nine unplanned releases of nonradioactive liquid in 2000. Of the nine unplanned releases, three were directly caused by the Cerro Grande fire. The following is a summary of these discharges.

- One unplanned release of high-explosive wastewater.
- Two unplanned releases of sanitary sewage from the Laboratory's TA-46 SWS Facility's collection system.
- One unplanned release of fire water/foam from a fire-suppression system.
- One release of elemental mercury in a sink trap connected to the SWS Facility's collection system.
- One canyon slope mass wasting from a failed potable water line saturating the soil and causing the failure.
- Three oil or diesel fuel releases caused by the Cerro Grande fire or post-fire remediation efforts.

ESH-18 investigated all unplanned releases of liquids. Upon cleanup, personnel from NMED-DOE Oversight Bureau (DOB) inspected the unplanned release site to ensure adequate cleanup. NMED-DOB recommended that we administratively close out one of the nine unplanned releases that occurred in 2000. It is anticipated that the rest of the unplanned release investigations will be closed when NMED-DOB personnel become available for inspections.

J. Special Studies

1. Surface Water Data at Los Alamos National Laboratory: 2000 Water Year

The Laboratory collected and published surface water discharge data from approximately 23 stream-gaging stations and 3 spring stations that cover most of the Laboratory. Table 5-3a presents a summary of flow data form Water Year 2000. Gaging stations with discharge data in the report, LA-13814-PR, "Surface Water Data at Los Alamos National Laboratory: 2000 Water Year" (Shaull et al., 2001), show higher peak flows than ever recorded. Tables 5-3a and 5-3b present a summary of peak flows following the Cerro Grande fire. Section 5.D., Runoff, summarizes water chemistry data from these storm events.

The Laboratory's annual water data report contains flow data. The data collection network seeks to characterize runoff from all watersheds at the Laboratory. We publish data for gages that have a stage discharge relationship. ESH-18 operates and maintains this network of 62 stations.

The Cerro Grande fire damaged 21 stations to the point of being inoperable. After the fire, the floods on June 28, 2000, destroyed eight additional stations. These stations have been rebuilt.

K. Tables

Table 5-1. Upper Watershed Burn Intensity (%)

	Unburned	Low	Medium	High
Guaje	29	22	26	22
Rendija	0	2	10	88
Pueblo	0	2	1	96
Los Alamos	25	43	0.5	32
Pajarito	0	44	3	53
Water	6	49	5	40

Source: BAER 2000.

Table 5-2. Predicted Peak Flow (cfs) from Upper Watersheds: 25-yr, 1-hr Storm (1.9”)

	Pre-Fire	Post-Fire	Treated
Guaje	7	437	NA
Rendija	1	2,398	1,740
Pueblo	9	1,278	983
Los Alamos	24	281	238
Pajarito	1	460	NA
Water	4	504	NA

Source: BAER 2000.

Table 5-3a. Summary of Discharges from Stream-Monitoring Stations at Los Alamos National Laboratory for Water Year 2000 (October 1, 1999–September 30, 2000)

Canyon Sites	Days with Flow	Volume of Water (Acre Feet)	Instantaneous Max (ft^3/s)
E025 Upper Los Alamos	53	97	60
E030 Middle Los Alamos	21	35	13
E040 DP Canyon at Mouth	14	30	117
E042 Lower Los Alamos[a]	22	27	17
E060 Pueblo[a]	365	618	114
E125 Sandia[a]	0	0	0
E200 Middle Mortandad	249	17	12
E202 Mortandad, above Sediment Traps	3	0.4	1.6
E203 Mortandad, below Sediment Traps	0	0	0
E204 Lower Mortandad[a]	0	0	0
E225 Upper Cañada del Buey	0	0	0
E230 Lower Cañada del Buey[a]	5	2.6	33
E240 Upper Pajarito[b]	25	57	1,020
E241 Pajarito at TA-22	276	95	300
E242 Starmer's Gulch at TA-22	365	46	180
E245 Middle Pajarito	8	20	517
E250 Lower Pajarito[a]	2	3.0	14
E252 Upper Water [b]	273	66	840
E253 Cañon de Valle[b]	1	52	740
E263 Water Canyon at State Rd. 4	19	61	306
E265 Lower Water[a]	22	53	271
E267 Potrillo[a]	5	0.7	37
E275 Ancho[a]	6	8.6	349
E350 Frijoles at Bandelier	365	526	40

[a] Station at downstream Laboratory boundary.
[b] Based on partial year of record.

Table 5-3b. Peak Flow at Selected Ungaged Sites

Station No.	Canyon	Drainage Area (mi^2)	Discharge (cfs)	Date 2000	Previous Peak	Record Began
NA	Rendija abv Guaje	9.58	900[a]	07/16	NA	NA
NA	Rendija abv Guaje	9.58	900[a]	07/17	NA	NA
NA	Rendija abv Guaje	9.58	900[a]	08/03	NA	NA
NA	Rendija abv Guaje	9.58	900[a]	09/08	NA	NA
NA	Guaje abv Rendija	14.6	840	07/16	NA	NA
NA	Guaje abv Rendija	14.6	827	07/17	NA	NA
NA	Guaje abv Rendija	14.6	1,350	08/27	NA	NA
NA	Guaje abv Rendija	14.6	1,200[b]	09/08	NA	NA

[a] All these peaks were less than 0.15 ft. difference in stage. Discharge by indirect methods except Sept. 8, which was estimated.
[b] Estimate based on high-water mark compared with indirect measured discharge on Aug. 27 peak.

Table 5-4. Radiochemical Analysis of Surface Water for 2000 (pCi/L[a])

Station Name	Date	Codes[b]		^{3}H			^{90}Sr				^{137}Cs			^{234}U			^{235,236}U			^{238}U			U (µg/L, lab)	
Regional Stations																								
Rio Chama at Chamita (bank)	07/12	UF	CS	100	450		0.18	0.05	0.15		0.00	3.63		0.468	0.044		0.0125	0.0114		0.257	0.030			
Rio Grande at Embudo (bank)	07/12	UF	CS	20	440		-0.02	0.04	0.14		0.00	8.63		1.528	0.093		0.0463	0.0188		0.891	0.067			
Rio Grande at Otowi Upper (bank)	08/14	UF	CS	-60	390						-1.11	9.55		0.669	0.051		0.0032	0.0111		0.396	0.038		1.29	0.13
Rio Grande at Otowi Upper (bank)	08/14	UF	CS				-0.03	0.11																
Rio Grande at Otowi (bank)	08/14	UF	CS	30	400						1.74	1.59		0.749	0.068		0.0065	0.0096		0.493	0.044		1.22	0.12
Rio Grande at Otowi (bank)	08/14	UF	CS				0.17	0.12																
Rio Grande at Frijoles (bank)	09/27	UF	CS	-60	56	193	-0.11	0.12	0.44	<	1.44	1.80	2.33	1.020	0.111	0.0588	0.0561	0.0229	0.068	0.602	0.076	0.017	1.73	
Rio Grande at Cochiti	09/27	UF	CS	0	57	192	0.19	0.09	0.31	<	0.18	0.89	3.06	1.020	0.112	0.0599	0.0137	0.0172	0.078	0.730	0.088	0.047		
Jemez River	07/13	UF	CS	-20	440		0.10	0.05	0.15		-3.50	33.93		0.693	0.047		0.0325	0.0112		0.414	0.035			
Pajarito Plateau Stations																								
Acid/Pueblo Canyons:																								
Pueblo 1 R	07/25	UF	CS	510	440		2.37	0.22	0.11		-0.60	3.68		0.775	0.057		0.0531	0.0163		1.005	0.065			
Acid Weir	07/25	UF	CS	690	450		14.00	1.25	0.14		0.00	5.21		0.139	0.029		0.0058	0.0106		0.091	0.020			
Pueblo 3	07/25	UF	CS	510	440		2.05	0.19	0.12		-0.30	2.61		0.411	0.037		0.0107	0.0073		0.416	0.037			
Pueblo at SR-502	08/14	UF	CS	30	400						1.46	1.48		0.030	0.020		-0.0087	0.0067		0.037	0.014		0.20	0.02
Pueblo at SR-502	08/14	UF	CS				0.65	0.14																
Pueblo at SR-502	12/06	UF	CS	-88	57	199	0.82	0.18	0.52		0.62	0.64	2.36	0.278	0.055	0.0831	0.0004	0.0108	0.083	0.143	0.037	0.024		
Pueblo at SR-502	12/06	UF	DUP								1.16	1.43	5.16											
DP/Los Alamos Canyons:																								
DPS-1	10/25	UF	CS	118	60	189	62.30	3.48	1.81		1.90	1.07	2.87	0.112	0.035	0.0866	0.0004	0.0113	0.087	0.037	0.019	0.025		
DPS-1	10/25	UF	DUP																					
Sandia Canyon:																								
SCS-1	08/16	UF	CS	120	410						-2.86	3.33		0.072	0.072		-0.0007	0.0069		0.053	0.014			
SCS-1	08/16	UF	CS				0.00	0.10																
SCS-2	08/16	UF	CS	210	420						-0.67	2.89		0.442	0.043		0.0142	0.0103		0.429	0.038			
SCS-2	08/16	UF	CS				-0.03	0.11																
SCS-3	08/16	UF	CS	30	400						-2.73	9.64		0.548	0.049		0.0507	0.0190		0.499	0.042			
SCS-3	08/16	UF	CS				0.43	0.14																
Mortandad Canyon:																								
Mortandad at GS-1	07/11	UF	CS	52,633	1,964		47.70	5.50	0.74					3.430	0.315	0.0229	0.0731	0.0145	0.013	1.130	0.110	0.018	3.81	
Mortandad at GS-1	07/11	F	CS				45.30	5.50	0.81					3.520	0.032	0.0190	0.0738	0.0135	0.014	1.080	0.105	0.010	3.79	
Mortandad at GS-1	08/16	UF	CS	35,500	2,100						31.40	3.82		0.976	0.078		0.0264	0.0348		0.454	0.046			
Mortandad at GS-1	08/16	UF	CS				11.70	1.10																
Mortandad at Rio Grande (A-11)	09/25	UF	CS	-89	54	191	0.09	0.14	0.48	<	-0.04	0.91	3.35	0.358	0.051	0.0485	-0.0008	0.0099	0.056	0.175	0.034	0.049	0.50	
Cañada del Buey:																								
Cañada del Buey	10/24	UF	CS	-30	56	192	0.02	0.11	0.40		0.98	0.74	2.84	0.270	0.054	0.1010	0.0044	0.0094	0.062	0.156	0.039	0.062		
Cañada del Buey	10/24	UF	DUP				0.66	0.17	0.53															

Table 5-4. Radiochemical Analysis of Surface Water for 2000 (pCi/L[a]) (Cont.)

Station Name	Date	Codes[b]		^{3}H			^{90}Sr				^{137}Cs			^{234}U			$^{235,236}U$			^{238}U			U (µg/L, lab)
Pajarito Plateau Stations (Cont.)																							
Pajarito Canyon:																							
Pajarito Canyon	10/24	UF	CS	-30	56	191	-0.10	0.10	0.36		0.00	1.60	2.41	0.510	0.087	0.1210	0.0342	0.0239	0.104	0.667	0.101	0.082	
Pajarito Retention Pond	08/24	F	CS				2.61	0.46	0.41		0.38	1.26	4.51	0.600	0.085	0.1570	0.0701	0.0292	0.110	0.600	0.082	0.094	2.42
Pajarito Retention Pond	08/24	F	DUP																				
Pajarito Retention Pond	08/24	UF	CS	0	0	0	3.36	0.44	0.38		2.19	1.19	4.44	1.040	0.121	0.1000	0.0627	0.0266	0.090	1.190	0.136	0.178	3.66
Pajarito Retention Pond	08/24	UF	DUP	0	0	0	2.86	0.37	0.37		1.19	1.35	4.80										
Pajarito at Rio Grande	09/26	UF	CS	-61	56	195	-0.06	0.10	0.36	<	1.06	0.64	2.41	0.708	0.079	0.0468	0.0042	0.0108	0.054	0.318	0.048	0.061	1.06
Pajarito at Rio Grande	09/26	UF	DUP																				1.04
Water Canyon:																							
Water Canyon at Beta	08/17	UF	CS	-60	390						1.28	1.21		0.172	0.025		-0.0033	0.0044		0.170	0.023		
Water Canyon at Beta	08/17	UF	CS				0.91	0.16															
Ancho Canyon:																							
Ancho at Rio Grande	09/26	UF	CS	-151	53	193	0.18	0.09	0.29	<	-0.66	0.66	2.26	0.087	0.025	0.0594	0.0055	0.0056	0.015	0.050	0.017	0.015	0.21
Ancho at Rio Grande	09/26	UF	CS	-61	56	194	0.19	0.09	0.31	<	1.08	0.70	2.36	0.069	0.021	0.0474	-0.0023	0.0073	0.048	0.099	0.024	0.038	0.18
Frijoles Canyon:																							
Frijoles at Monument Headquarters	08/22	UF	CS	-201	51	189	0.04	0.22	0.38	<	-0.93	0.93	3.11	0.097	0.027	0.0495	0.0068	0.0068	0.018	0.081	0.024	0.018	
Frijoles at Monument Headquarters	08/22	UF	DUP																				0.09
Frijoles at Monument Headquarters	08/22	UF	CS	-142	52	187	0.67	0.16	0.24	<	0.34	0.98	3.49	0.121	0.030	0.0183	0.0029	0.0114	0.073	0.024	0.014	0.050	
Frijoles at Rio Grande	08/22	UF	CS	-141	51	185	0.94	0.34	0.51	<	-0.70	1.04	3.11	0.018	0.021	0.1100	0.0034	0.0177	0.111	0.029	0.020	0.088	
Water Quality Standards[c]																							
DOE DCG for Public Dose				2,000,000			1,000				3,000			500			600			600			800
DOE Drinking Water System DCG				80,000			40				120			20			24			24			30
EPA Primary Drinking Water Standard				20,000			8																30
EPA Screening Level																							
NMWQCC Groundwater Limit																							5,000

Table 5-4. Radiochemical Analysis of Surface Water for 2000 (pCi/L[a]) (Cont.)

Station Name	Date	Codes[b]		U (µg/L, calc)		^{238}Pu			^{239,240}Pu			^{241}Am			Gross Alpha			Gross Beta			Gross Gamma	
Regional Stations																						
Rio Chama at Chamita (bank)	07/12	UF	CS	0.77	0.09	-0.001	0.007		0.007	0.007		0.008	0.006		2.5	2.3		4.9	4.5		37.9	51.1
Rio Grande at Embudo (bank)	07/12	UF	CS	2.67	0.20	0.003	0.005		0.010	0.009		-0.018	0.026		3.7	2.7		4.8	4.5		46.5	51.2
Rio Grande at Otowi Upper (bank)	08/14	UF	CS	1.18	0.11	0.003	0.003		0.001	0.004		-0.008	0.007		5.7	3.7		6.8	3.8		6.1	48.9
Rio Grande at Otowi Upper (bank)	08/14	UF	CS																			
Rio Grande at Otowi (bank)	08/14	UF	CS	1.47	0.13	0.011	0.008		0.006	0.006		-0.006	0.005		4.3	3.3		5.5	3.4		16.3	49.0
Rio Grande at Otowi (bank)	08/14	UF	CS																			
Rio Grande at Frijoles (bank)	09/27	UF	CS	1.82	0.23	0.264	0.047	0.022	0.027	0.010	0.008	0.028	0.010	0.010	3.5	1.1	1.8	5.0	1.1	3.4		
Rio Grande at Cochiti	09/27	UF	CS	2.18	0.26	0.188	0.036	0.008	0.022	0.009	0.008	0.081	0.020	0.040	2.5	0.9	2.0	8.1	1.2	2.8		
Jemez River	07/13	UF	CS	1.25	0.10	0.008	0.008		0.008	0.007		0.022	0.009		23.0	10.1		14.8	9.8		49.3	51.2
Pajarito Plateau Stations																						
Acid/Pueblo Canyons:																						
Pueblo 1 R	07/25	UF	CS	3.02	0.19	-0.003	0.003		0.032	0.012		0.158	0.212		6.5	2.8		9.9	3.5		449.8	53.9
Acid Weir	07/25	UF	CS	0.27	0.06	0.016	0.007		0.041	0.012		0.014	0.006		0.2	0.7		15.0	5.9		439.8	53.8
Pueblo 3	07/25	UF	CS	1.24	0.11	0.019	0.009		0.156	0.026		0.015	0.009		1.3	1.4		6.7	2.8		595.7	59.6
Pueblo at SR-502	08/14	UF	CS	0.10	0.04	0.061	0.015		0.097	0.019		0.023	0.011		2.7	3.7		16.2	7.3		34.6	49.1
Pueblo at SR-502	08/14	UF	CS																			
Pueblo at SR-502	12/06	UF	CS	0.43	0.11	0.008	0.010	0.045	0.029	0.012	0.013	0.019	0.009	0.010	-0.2	0.4	0.9	10.5	0.8	1.7		
Pueblo at SR-502	12/06	UF	DUP												0.0	0.3	1.0	10.0	0.8	1.7		
DP/Los Alamos Canyons:																						
DPS-1	10/25	UF	CS	0.11	0.06	0.019	0.009	0.024	0.048	0.014	0.009	0.107	0.021	0.027	1.1	0.4	0.9	43.5	2.4	1.4		
DPS-1	10/25	UF	DUP			0.012	0.006	0.008	0.040	0.013	0.008	0.130	0.024	0.041								
Sandia Canyon:																						
SCS-1	08/16	UF	CS	0.16	0.04	0.110	0.022		0.009	0.009		-0.001	0.002		3.6	6.1		19.6	10.2		266.7	50.3
SCS-1	08/16	UF	CS																			
SCS-2	08/16	UF	CS	1.28	0.11	0.011	0.011		0.119	0.024		-0.009	0.013		15.0	9.4		20.6	10.5		392.3	51.2
SCS-2	08/16	UF	CS																			
SCS-3	08/16	UF	CS	1.51	0.13	0.015	0.009		0.064	0.017		0.008	0.004		8.1	7.3		16.9	9.4		141.1	49.5
SCS-3	08/16	UF	CS																			
Mortandad Canyon:																						
Mortandad at GS-1	07/11	UF	CS	3.40	0.33	2.700	0.230	0.014	1.870	0.160	0.020	1.510	0.135	0.013								
Mortandad at GS-1	07/11	F	CS	3.25	0.31	1.520	0.140	0.025	0.822	0.085	0.009	0.603	0.060	0.011								
Mortandad at GS-1	08/16	UF	CS	1.36	0.14	5.008	0.238		6.754	0.308		6.384	0.244		39.9	13.0		82.4	21.5		262.0	50.3
Mortandad at GS-1	08/16	UF	CS																			
Mortandad at Rio Grande (A-11)	09/25	UF	CS	0.52	0.10	0.000	1.010	0.015	0.005	0.005	0.015	0.032	0.010	0.009	0.4	0.8	3.0	13.8	1.7	3.2		
Cañada del Buey:																						
Cañada del Buey	10/24	UF	CS	0.47	0.12	0.000	1.010	0.008	0.009	0.008	0.027	0.022	0.009	0.010	1.6	0.6	1.5	6.9	0.8	2.2		
Cañada del Buey	10/24	UF	DUP																			

Table 5-4. Radiochemical Analysis of Surface Water for 2000 (pCi/L[a]) (Cont.)

Station Name	Date	Codes[b]		U (µg/L, calc)		^{238}Pu			^{239,240}Pu			^{241}Am			Gross Alpha			Gross Beta			Gross Gamma		
Pajarito Plateau Stations (Cont.)																							
Pajarito Canyon:																							
Pajarito Canyon	10/24	UF	CS	2.00	0.30	0.024	0.013	0.036	-0.003	0.006	0.031	0.010	0.009	0.032	2.1	0.6	1.0	14.8	1.1	2.1			
Pajarito Retention Pond	08/24	F	CS	1.82	0.25	0.057	0.017	0.034	0.016	0.011	0.034	0.040	0.016	0.043	2.4	0.6	1.2	13.2	1.4	3.0			
Pajarito Retention Pond	08/24	F	DUP			0.025	0.011	0.026	0.011	0.006	0.010	0.012	0.009	0.028									
Pajarito Retention Pond	08/24	UF	CS	3.57	0.40	0.031	0.015	0.038	0.129	0.032	0.038	0.060	0.016	0.026	16.9	3.2	1.5	38.1	2.8	2.9			
Pajarito Retention Pond	08/24	UF	DUP																				
Pajarito at Rio Grande	09/26	UF	CS	0.95	0.14	0.124	0.028	0.011	0.097	0.024	0.028	0.008	0.008	0.029	-0.5	0.4	1.8	0.7	0.7	2.5			
Pajarito at Rio Grande	09/26	UF	DUP												0.3	0.5	1.9	3.1	0.9	2.8			
Water Canyon:																							
Water Canyon at Beta	08/17	UF	CS	0.51	0.07	0.028	0.014		0.002	0.011		0.005	0.004		2.8	2.8		8.5	4.3		29.0	48.7	
Water Canyon at Beta	08/17	UF	CS																				
Ancho Canyon:																							
Ancho at Rio Grande	09/26	UF	CS	0.15	0.05	0.032	0.015	0.037	0.012	0.007	0.011	0.022	0.014	0.044	0.4	0.4	1.4	2.4	0.8	2.5			
Ancho at Rio Grande	09/26	UF	CS	0.29	0.07	0.054	0.016	0.010	0.004	0.007	0.028	0.000	1.000	0.028	0.6	0.4	1.4	1.7	0.7	2.2			
Frijoles Canyon:																							
Frijoles at Monument Headquarters	08/22	UF	CS	0.24	0.07	0.024	0.012	0.029	0.016	0.008	0.011	0.171	0.029	0.031	0.6	0.4	1.3	3.8	0.9	2.6			
Frijoles at Monument Headquarters	08/22	UF	DUP												0.5	0.3	1.1	3.4	0.5	1.4			
Frijoles at Monument Headquarters	08/22	UF	CS	0.07	0.04	-0.004	0.007	0.036	0.039	0.015	0.029	0.016	0.008	0.011	1.1	0.6	1.9	3.5	1.0	3.0			
Frijoles at Rio Grande	08/22	UF	CS	0.09	0.06	-0.003	0.004	0.026	0.031	0.011	0.009	0.023	0.010	0.012	1.0	0.5	1.4	3.9	0.9	2.7			
Water Quality Standards[c]																							
DOE DCG for Public Dose				800		40			30			30			30			1,000					
DOE Drinking Water System DCG				30		1.6			1.2			1.2			1.2			40					
EPA Primary Drinking Water Standard				30											15								
EPA Screening Level																		50					
NMWQCC Groundwater Limit				5,000																			

[a] Except where noted. Three columns are listed: the first is the analytical result, the second is the radioactive counting uncertainty (1 standard deviation), and the third is the analytical laboratory measurement-specific minimum detectable activity.
[b] Codes: UF-unfiltered; F-filtered; CS-customer sample; DUP-laboratory duplicate.
[c] Standards given here for comparison only; see Appendix A.

Table 5-5 Detections of Radionuclides[a] and Comparison to Standards[b] in Surface Water Samples for 2000

Station Name	Date	Code[c,d]	Analyte	Symbol	Result	Uncertainty[e]	MDA[f]	Units	Lab Qual Code[g]	Result/ Min Std	Min Std	Min Std Type	DOE DCG	Result/ DOE DCG
Regional Stations														
Rio Chama at Chamita (bank)	07/12	UF CS	^{90}Sr		0.18	0.05	0.15	pCi/L						
Rio Grande at Frijoles (bank)	09/27	UF CS	^{238}Pu		0.264	0.047	0.022	pCi/L						
Rio Grande at Cochiti	09/27	UF CS	^{241}Am		0.081	0.020	0.040	pCi/L	B					
Rio Grande at Cochiti	09/27	UF CS	^{238}Pu		0.188	0.036	0.008	pCi/L						
Pajarito Plateau Stations														
Acid/Pueblo Canyons:														
Pueblo 1 R	07/25	UF CS	^{90}Sr		2.37	0.22	0.11	pCi/L						
Acid Weir	07/25	UF CS	^{239,240}Pu		0.041	0.012		pCi/L						
Acid Weir	07/25	UF CS	^{90}Sr		14.00	1.25	0.14	pCi/L		1.75	8	EPA PRIM DW STD		
Pueblo 3	07/25	UF CS	^{239,240}Pu		0.156	0.026		pCi/L						
Pueblo 3	07/25	UF CS	^{90}Sr		2.05	0.19	0.12	pCi/L						
Pueblo at SR-502	08/14	UF CS	^{238}Pu		0.061	0.015		pCi/L						
Pueblo at SR-502	08/14	UF CS	^{239,240}Pu		0.097	0.019		pCi/L						
Pueblo at SR-502	12/06	UF CS	^{90}Sr		0.82	0.18	0.52	pCi/L						
DP/Los Alamos Canyons:														
DPS-1	10/25	UF DUP	^{241}Am		0.130	0.024	0.041	pCi/L						
DPS-1	10/25	UF CS	^{241}Am		0.107	0.021	0.027	pCi/L						
DPS-1	10/25	UF CS	Gross Beta		43.5	2.4	1.4	pCi/L		0.87	50	EPA SEC DW LVL		
DPS-1	10/25	UF CS	^{239,240}Pu		0.048	0.014	0.009	pCi/L						
DPS-1	10/25	UF DUP	^{239,240}Pu		0.040	0.013	0.008	pCi/L						
DPS-1	10/25	UF CS	^{90}Sr		62.30	3.48	1.81	pCi/L		7.79	8	EPA PRIM DW STD		
Sandia Canyon:														
SCS-1	08/16	UF CS	^{238}Pu		0.110	0.022		pCi/L						
SCS-2	08/16	UF CS	^{239,240}Pu		0.119	0.024		pCi/L						
SCS-3	08/16	UF CS	^{239,240}Pu		0.064	0.017		pCi/L						
Mortandad Canyon:														
Mortandad at GS-1	07/11	F CS	^{241}Am		0.603	0.060	0.011	pCi/L		0.50	1.2	DOE DW DCG		
Mortandad at GS-1	07/11	F CS	^{238}Pu		1.520	0.140	0.025	pCi/L		0.95	1.6	DOE DW DCG		
Mortandad at GS-1	07/11	F CS	^{239,240}Pu		0.822	0.085	0.009	pCi/L		0.69	1.2	DOE DW DCG		
Mortandad at GS-1	07/11	F CS	^{90}Sr		45.30	5.50	0.81	pCi/L		5.66	8	EPA PRIM DW STD		
Mortandad at GS-1	07/11	UF CS	^{241}Am		1.510	0.135	0.013	pCi/L		1.26	1.2	DOE DW DCG		
Mortandad at GS-1	07/11	UF CS	^{3}H		52,633	1,964		pCi/L		2.63	20,000	EPA PRIM DW STD		
Mortandad at GS-1	07/11	UF CS	^{238}Pu		2.700	0.230	0.014	pCi/L		1.69	1.6	DOE DW DCG		
Mortandad at GS-1	07/11	UF CS	^{239,240}Pu		1.870	0.160	0.020	pCi/L		1.56	1.2	DOE DW DCG		
Mortandad at GS-1	07/11	UF CS	^{90}Sr		47.70	5.50	0.74	pCi/L		5.96	8	EPA PRIM DW STD		
Mortandad at GS-1	08/16	UF CS	^{241}Am		6.384	0.244		pCi/L		5.32	1.2	DOE DW DCG		
Mortandad at GS-1	08/16	UF CS	^{137}Cs		31.40	3.82		pCi/L						
Mortandad at GS-1	08/16	UF CS	Gross Alpha		39.9	13.0		pCi/L		2.66	15	EPA PRIM DW STD	30	1.33
Mortandad at GS-1	08/16	UF CS	Gross Beta		82.4	21.5		pCi/L		1.65	50	EPA SEC DW LVL		
Mortandad at GS-1	08/16	UF CS	^{3}H		35,500	2,100		pCi/L		1.78	20,000	EPA PRIM DW STD		
Mortandad at GS-1	08/16	UF CS	^{238}Pu		5.008	0.238		pCi/L		3.13	1.6	DOE DW DCG		
Mortandad at GS-1	08/16	UF CS	^{239,240}Pu		6.754	0.308		pCi/L		5.63	1.2	DOE DW DCG		
Mortandad at Rio Grande (A-11)	09/25	UF CS	^{241}Am		0.032	0.010	0.009	pCi/L	B					

Table 5-5 Detections of Radionuclides[a] and Comparison to Standards[b] in Surface Water Samples for 2000 (Cont.)

Station Name	Date	Code[c,d]	Analyte	Symbol	Result	Uncertainty[e]	MDA[f]	Units	Lab Qual Code[g]	Result/ Min Std	Min Std	Min Std Type	DOE DCG	Result/ DOE DCG
Pajarito Plateau Stations (Cont.)														
Cañada del Buey:														
Cañada del Buey	10/24	UF DUP	^{90}Sr		0.66	0.17	0.53	pCi/L						
Pajarito Canyon:														
Pajarito at Rio Grande	09/26	UF CS	^{241}Am		0.029	0.008	0.029	pCi/L	U					
Pajarito at Rio Grande	09/26	UF CS	^{238}Pu		0.124	0.028	0.011	pCi/L						
Pajarito at Rio Grande	09/26	UF CS	$^{239,240}Pu$		0.097	0.024	0.028	pCi/L						
Ancho Canyon:														
Ancho at Rio Grande	09/26	UF CS	^{241}Am		0.044	0.014	0.044	pCi/L	U					
Ancho at Rio Grande	09/26	UF CS	^{238}Pu		0.054	0.016	0.010	pCi/L						
Ancho at Rio Grande	09/26	UF CS	$^{239,240}Pu$		0.028	0.007	0.028	pCi/L	U					
Frijoles Canyon:														
Frijoles at Monument Headquarters	08/22	UF CS	^{241}Am		0.171	0.029	0.031	pCi/L						
Frijoles at Monument Headquarters	08/22	UF CS	^{90}Sr		0.67	0.16	0.24	pCi/L						

[a] Detection defined as value ≥ 3× uncertainty and ≥ detection limit, except values shown for uranium ≥ 5 µg/L, for gross alpha ≥ 5 pCi/L, and for gross beta ≥ 20 pCi/L. Note that some results in this table were qualified as nondetections by the analytical laboratory.
[b] Values indicated by entries in right-hand columns are greater than half the minimum standard shown. The minimum standard is either a DOE derived concentration guide (DCG) for DOE-administered drinking water systems or an EPA drinking water standard.
[c] UF–unfiltered, F–filtered.
[d] Codes: CS–customer sample; DUP–duplicate; TRP–triplicate; RE–reanalysis; TOTC–value calculated from other results; TOTCD–duplicate calculated value.
[e] One standard deviation radioactivity counting uncertainty.
[f] Minimum detectable activity.
[g] Codes: B–analyte found in lab blank; U–analyte not detected.

Table 5-6. Summary of TA-50 Radionuclide, Nitrate, and Fluoride Discharges[a]

	1963–1977	1998			1999			2000		
Radionuclide	Total Activity Released (mCi)[b]	Total Annual Activity (mCi)	Mean Activity (pCi/L)	Ratio of Activity to DCG[c]	Total Annual Activity (mCi)	Mean Activity (pCi/L)	Ratio of Activity to DCG[c]	Total Annual Activity (mCi)	Mean Activity (pCi/L)	Ratio of Activity to DCG[c]
^{3}H	25,150	1,228	52,840	0.03	485	24,252	0.01	907	48,713	0.024
^{241}Am	7	2	99.1	3.30	1.1	55.0	1.83	0.041	2.25	0.075
^{137}Cs	848	1	43.4	0.01	1.5	76.9	0.026	3.1	166.7	0.056
^{238}Pu	51	2	97.9	2.45	2.4	121.3	3.03	0.063	3.39	0.085
$^{239,240}Pu$	39	0.91	39	1.30	1.40	70.0	2.33	0.035	1.86	0.062
^{89}Sr	<1	2	86.8	0.004	0.36	18.2	0.0009	0.332	17.8	0.0009
^{90}Sr	295	0.82	35.3	0.04	0.52	26.0	0.026	0.170	9.1	0.009
^{234}U	NA	0.12	5.1	0.01	0.17	8.6	0.017	0.037	1.98	0.004
^{235}U	2	0.053	2.3	0.004	0.0047	0.24	0.0004	0.016	0.86	0.0014

Constituent	Total Annual Mass (kg)	Mean Concentration (mg/L)	Ratio of Concentration to MCL[d]	Total Annual Mass (kg)	Mean Concentration (mg/L)	Ratio of Concentration to MCL[d]	Total Annual Mass (kg)	Mean Concentration (mg/L)	Ratio of Concentration to MCL[d]
NO_3-N	1,420	61.1	6.1	486	24.2	2.4	46.6	2.50	0.25
F	37.6	1.62	1.0	22.6	1.12	0.7	5.29	0.28	0.17
Total effluent volume ($\times 10^7$ liters)	2.32			2.00			1.86		

[a]Compiled from Radioactive Liquid Waste Group (FWO-RLW) Annual Reports. Data for 2000 are preliminary.
[b]DOE 1979; decay corrected through 12/77.
[c]Public dose limit.
[d]New Mexico Groundwater Limit.

Table 5-7. Chemical Quality of Surface Water for 2000 (mg/L[a])

Station Name	Date	Code[b]		SiO_2	Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity	Total Alkalinity	F	PO_4-P
Regional Stations														
Rio Chama at Chamita (bank)	07/12	F	CS	14	35.3	6.4	1.5	11.5	2.0	54.4	<[f] 5	84	0.14	0.06
Rio Chama at Chamita (bank)	07/12	UF	CS											
Rio Grande at Embudo (bank)	07/12	F	CS	26	28.9	6.6	3.1	21.6	6.8	40.5	12	112	0.69	0.06
Rio Grande at Embudo (bank)	07/12	UF	CS											
Rio Grande at Otowi Upper (bank)	08/14	F	CS	16	37.4	6.6	2.4	13.4	2.8	56.6	< 5	94	0.19	0.06
Rio Grande at Otowi Upper (bank)	08/14	UF	CS											
Rio Grande at Otowi (bank)	08/14	F	CS	20	38.3	6.5	2.2	14.8	5.2	53.6	< 5	104	0.16	0.06
Rio Grande at Otowi (bank)	08/14	UF	CS											
Rio Grande at Frijoles (bank)	09/27	F	CS	18	44.7	8.6	2.6	21.3	4.0	69.8	1	99	0.29	< 0.02
Rio Grande at Frijoles (bank)	09/27	F	DUP											
Rio Grande at Frijoles (bank)	09/27	UF	CS											
Rio Grande at Frijoles (bank)	09/27	UF	DUP											
Rio Grande at Cochiti	09/27	F	CS	19	46.0	8.8	2.7	17.8	4.3	69.0	1	98	0.28	< 0.02
Rio Grande at Cochiti	09/27	F	DUP	18	45.2	8.6	2.6	17.5					0.27	< 0.02
Rio Grande at Cochiti	09/27	F	TRP											
Rio Grande at Cochiti	09/27	UF	CS											
Jemez River	07/13	F	CS	50	48.7	5.2	13.9	90.2	126.0	9.6	17	180	1.23	0.06
Jemez River	07/13	UF	CS											
Pajarito Plateau Stations														
Acid/Pueblo Canyons:														
Pueblo 1 R	07/25	F	CS	21	40.1	5.7	6.8	27.3	24.3	16.5	< 5	140	0.15	0.22
Pueblo 1 R	07/25	UF	CS											
Acid Weir	07/25	F	CS	25	33.6	3.3	4.9	29.4	13.8	7.5	< 5	52	0.19	0.16
Acid Weir	07/25	UF	CS											
Pueblo 3	07/25	F	CS	73	37.9	7.5	15.5	64.0	42.1	3.7	< 5	278	0.52	6.42
Pueblo 3	07/25	UF	CS											
Pueblo at SR-502	08/14	F	CS		26.1	5.6	14.9	76.7						
Pueblo at SR-502	08/14	UF	CS											
Pueblo at SR-502	12/06	UF	CS											
DP/Los Alamos Canyons:														
DPS-1	10/25	F	CS	14	24.7	1.5	3.6	17.2	16.0	7.0	< 1	72	0.24	0.03
DPS-1	10/25	F	DUP	12	25.6	1.6	3.7	17.8					0.25	
DPS-1	10/25	UF	CS											
Sandia Canyon:														
SCS-1	08/16	F	CS	125	28.2	9.5	22.3	144.8	30.2	155.0	16	230	0.60	5.50
SCS-1	08/16	UF	CS											
SCS-2	08/16	F	CS	103	25.5	6.2	16.6	174.8	122.0	123.0	11	223	0.69	6.01
SCS-2	08/16	UF	CS											
SCS-3	08/16	F	CS	100	25.2	6.0	16.0	174.9	119.0	124.0	< 5	211	0.67	5.72
SCS-3	08/16	UF	CS											

Table 5-7. Chemical Quality of Surface Water for 2000 (mg/L[a]) (Cont.)

Station Name	Date	Code[b]	SiO_2	Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity	Total Alkalinity	F	PO_4-P
Pajarito Plateau Stations (Cont.)													
Mortandad Canyon:													
Mortandad at GS-1	07/11	UF CS		47.4	2.7	9.2	79.1						0.22
Mortandad at GS-1	07/11	F CS		46.8	2.6	8.6	76.1	8.0	23.0	< 10	240	0.89	0.16
Mortandad at GS-1	08/16	F CS	59	19.5	1.8	3.0	77.3	4.2	1.0	< 5	< 5	0.50	0.22
Mortandad at GS-1	08/16	UF CS											
Mortandad at Rio Grande (A-11)	09/25	F CS	83	31.2	7.4	14.2	92.7	63.4	34.9	3	128	0.34	4.08
Mortandad at Rio Grande (A-11)	09/25	F DUP											
Mortandad at Rio Grande (A-11)	09/25	UF CS											
Cañada del Buey:													
Cañada del Buey	10/24	F CS	21	16.5	3.5	4.2	10.3	14.7	20.5	< 1	93	0.23	0.12
Cañada del Buey	10/24	F DUP										0.23	
Cañada del Buey	10/24	UF CS											
Cañada del Buey	10/24	UF DUP											
Pajarito Canyon:													
Pajarito Canyon	10/24	F CS	14	34.8	4.7	9.9	9.4	8.9	12.1	< 1	31	0.16	0.50
Pajarito Canyon	10/24	F DUP											
Pajarito Canyon	10/24	UF CS											
Pajarito Canyon	10/24	UF DUP											
Pajarito Retention Pond	08/24	F CS	21	42.3	7.0	10.4	7.8	5.8	9.4	< 1	133	0.15	0.45
Pajarito Retention Pond	08/24	F DUP						5.8	9.3	< 1	130	0.16	0.40
Pajarito Retention Pond	08/24	UF CS											
Pajarito Retention Pond	08/24	F CS											
Pajarito Retention Pond	08/24	UF CS			8.9								1.86
Pajarito Retention Pond	08/24	UF DUP											1.76
Pajarito at Rio Grande	09/26	F CS	67	22.9	4.8	2.9	15.3	4.7	5.0	< 1	84	0.43	< 0.02
Pajarito at Rio Grande	09/26	F DUP											< 0.02
Pajarito at Rio Grande	09/26	UF CS											
Pajarito at Rio Grande	09/26	UF DUP											
Water Canyon:													
Water Canyon at Beta	08/17	F CS	47	26.2	7.1	5.6	17.4	7.7	4.9	< 5	131	0.12	0.17
Water Canyon at Beta	08/17	UF CS											
Ancho Canyon:													
Ancho at Rio Grande	09/26	F CS	71	15.1	3.7	2.1	12.2	2.3	2.1	1	64	0.35	< 0.02
Ancho at Rio Grande	09/26	F DUP											
Ancho at Rio Grande	09/26	UF CS											
Ancho at Rio Grande	09/26	F CS	72	14.7	3.6	2.0	12.0	2.2	2.0	1	62	0.36	< 0.02
Ancho at Rio Grande	09/26	F DUP											
Ancho at Rio Grande	09/26	UF CS											

Table 5-7. Chemical Quality of Surface Water for 2000 (mg/L[a]) (Cont.)

Station Name	Date	Code[b]		SiO_2	Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity	Total Alkalinity	F	PO_4-P
Pajarito Plateau Stations (Cont.)														
Frijoles Canyon:														
Frijoles at Monument Headquarters	08/22	F	CS	61	9.7	2.9	2.1	10.6	1.9	1.5	< 1	60	0.17	0.09
Frijoles at Monument Headquarters	08/22	F	DUP	64	10.1	3.1	2.2	10.3			< 1			
Frijoles at Monument Headquarters	08/22	UF	CS											
Frijoles at Monument Headquarters	08/22	UF	DUP											
Frijoles at Monument Headquarters	08/22	F	CS	62	10.0	3.0	2.1	10.5	1.8	1.4	< 1	56	0.15	0.09
Frijoles at Monument Headquarters	08/22	UF	CS											
Frijoles at Rio Grande	08/22	F	CS	61	11.0	3.0	2.5	10.8	2.0	1.4	< 1	58	0.17	0.11
Frijoles at Rio Grande	08/22	UF	CS											
Water Quality Standards[g]														
EPA Primary Drinking Water Standard										500			4.0	
EPA Secondary Drinking Water Standard									250	250				
EPA Health Advisory								20						
NMWQCC Groundwater Limit									250	600			1.6	
NMWQCC Wildlife Habitat Standard														

Table 5-7. Chemical Quality of Surface Water for 2000 (mg/L[a]) (Cont.)

Station Name	Date	Code[b]		NO_3+ NO_2-N	ClO_4 (µg/L)	CN (amen)	CN (Total)	TDS[c]	TSS[d]	Hardness as $CaCO_3$	Field pH[e]	Lab pH[e]	Conductance (µS/cm)
Regional Stations													
Rio Chama at Chamita (bank)	07/12	F	CS	0.07				140		114.8		6.7	263
Rio Chama at Chamita (bank)	07/12	UF	CS		< 1.00		0.0300		42.0				
Rio Grande at Embudo (bank)	07/12	F	CS	0.06				166		99.3		8.1	290
Rio Grande at Embudo (bank)	07/12	UF	CS		< 1.00		0.0300		10.0		8.6		
Rio Grande at Otowi Upper (bank)	08/14	F	CS	0.11				216		120.8		7.9	287
Rio Grande at Otowi Upper (bank)	08/14	UF	CS		< 1.00		0.0100		69.0		8.3		
Rio Grande at Otowi (bank)	08/14	F	CS	0.13				230		122.3		8.0	303
Rio Grande at Otowi (bank)	08/14	UF	CS		< 1.00		0.0100		68.0		8.3		
Rio Grande at Frijoles (bank)	09/27	F	CS	0.04				208		147.0			346
Rio Grande at Frijoles (bank)	09/27	F	DUP					220					
Rio Grande at Frijoles (bank)	09/27	UF	CS		< 1.04	< 0.0028	< 0.0028		49.5		8.5		
Rio Grande at Frijoles (bank)	09/27	UF	DUP						56.8				
Rio Grande at Cochiti	09/27	F	CS	0.11				220		151.0			346
Rio Grande at Cochiti	09/27	F	DUP	0.11				224					349
Rio Grande at Cochiti	09/27	F	TRP					229					
Rio Grande at Cochiti	09/27	UF	CS		< 1.04	< 0.0028	< 0.0028		55.8		8.3		
Jemez River	07/13	F	CS	0.01				458		143.0		8.0	700
Jemez River	07/13	UF	CS		< 1.00		0.0300		13.0		8.6		
Pajarito Plateau Stations													
Acid/Pueblo Canyons:													
Pueblo 1 R	07/25	F	CS	0.42				300		123.5		7.5	353
Pueblo 1 R	07/25	UF	CS		< 1.00		0.0200		64.0		7.8		
Acid Weir	07/25	F	CS	1.28				310		97.5		7.3	366
Acid Weir	07/25	UF	CS		< 1.00		0.0100		82.0		6.6		
Pueblo 3	07/25	F	CS	0.02				442		125.4		7.6	642
Pueblo 3	07/25	UF	CS		< 1.00		0.0200		4.0		7.3		
Pueblo at SR-502	08/14	F	CS										
Pueblo at SR-502	08/14	UF	CS		< 1.00				1.0		7.1		
Pueblo at SR-502	12/06	UF	CS		< 1.04				12.6		8.9		
DP/Los Alamos Canyons:													
DPS-1	10/25	F	CS	0.09				136		1,800.0			197
DPS-1	10/25	F	DUP					141					
DPS-1	10/25	UF	CS		< 1.04	< 0.0028	< 0.0028		< 1.0				
Sandia Canyon:													
SCS-1	08/16	F	CS	2.14				610		109.3		8.7	974
SCS-1	08/16	UF	CS		< 1.00		0.0200		3.0		8.5		
SCS-2	08/16	F	CS	0.28				804		89.1		9.0	1,028
SCS-2	08/16	UF	CS		< 1.00		0.0100		14.0		8.3		
SCS-3	08/16	F	CS	0.20				752		87.5		8.5	1,003
SCS-3	08/16	UF	CS		< 1.00		0.0100		19.0		8.3		

Table 5-7. Chemical Quality of Surface Water for 2000 (mg/L[a]) (Cont.)

Station Name	Date	Code[b]	NO_3+ NO_2-N	ClO_4 (µg/L)	CN (amen)	CN (Total)	TDS[c]	TSS[d]	Hardness as $CaCO_3$	Field pH[e]	Lab pH[e]	Conductance (µS/cm)
Pajarito Plateau Stations (Cont.)												
Mortandad Canyon:												
Mortandad at GS-1	07/11	UF CS	3.90			0.0025		14.0				
Mortandad at GS-1	07/11	F CS	3.70									
Mortandad at GS-1	08/16	F CS	4.34				586		56.2		7.4	10
Mortandad at GS-1	08/16	UF CS		39.00		0.0100		2.0		7.9		
Mortandad at Rio Grande (A-11)	09/25	F CS	5.95				402		108.0			597
Mortandad at Rio Grande (A-11)	09/25	F DUP					434					
Mortandad at Rio Grande (A-11)	09/25	UF CS		< 1.04	< 0.0028	< 0.0028		5.8		8.4		
Cañada del Buey:												
Cañada del Buey	10/24	F CS	0.71				147		55.8			159
Cañada del Buey	10/24	F DUP					153					
Cañada del Buey	10/24	UF CS		< 1.04	< 0.0028	0.0037		14.7		6.6		
Cañada del Buey	10/24	UF DUP						16.0				
Pajarito Canyon:												
Pajarito Canyon	10/24	F CS	0.15				195		106.0			230
Pajarito Canyon	10/24	F DUP					202					231
Pajarito Canyon	10/24	UF CS		< 1.04	< 0.0028	0.0059		90.0		8.1		
Pajarito Canyon	10/24	UF DUP						98.7				
Pajarito Retention Pond	08/24	F CS	< 0.01				222					282
Pajarito Retention Pond	08/24	F DUP					228					
Pajarito Retention Pond	08/24	UF CS								7.3		
Pajarito Retention Pond	08/24	F CS					283					
Pajarito Retention Pond	08/24	UF CS	< 0.01		0.0046	0.0080		216.0				296
Pajarito Retention Pond	08/24	UF DUP	< 0.01		0.0032	0.0073		198.0				299
Pajarito at Rio Grande	09/26	F CS	0.74				167		77.1			196
Pajarito at Rio Grande	09/26	F DUP	0.74				169					
Pajarito at Rio Grande	09/26	UF CS		1.25	< 0.0028	< 0.0028		1.8		7.8		
Pajarito at Rio Grande	09/26	UF DUP		< 1.04	< 0.0028	< 0.0028						
Water Canyon:												
Water Canyon at Beta	08/17	F CS	0.13				286		94.7		1.7	273
Water Canyon at Beta	08/17	UF CS		< 1.00		0.0100		18.0		7.9		
Ancho Canyon:												
Ancho at Rio Grande	09/26	F CS	0.03				140		52.8			138
Ancho at Rio Grande	09/26	F DUP					163					
Ancho at Rio Grande	09/26	UF CS		< 1.04	< 0.0028	< 0.0028		3.0		8.2		
Ancho at Rio Grande	09/26	F CS	0.03				110		51.3			139
Ancho at Rio Grande	09/26	F DUP					135					
Ancho at Rio Grande	09/26	UF CS		< 1.04	< 0.0028	< 0.0028		< 0.7				

Table 5-7. Chemical Quality of Surface Water for 2000 (mg/L[a]) (Cont.)

Station Name	Date	Code[b]		NO_3+ NO_2-N	ClO_4 (µg/L)	CN (amen)	CN (Total)	TDS[c]	TSS[d]	Hardness as $CaCO_3$	Field pH[e]	Lab pH[e]	Conductance (µS/cm)
Pajarito Plateau Stations (Cont.)													
Frijoles Canyon:													
Frijoles at Monument Headquarters	08/22	F	CS	0.05				134					100
Frijoles at Monument Headquarters	08/22	F	DUP					123					101
Frijoles at Monument Headquarters	08/22	UF	CS		1.24		< 0.0028		22.0				
Frijoles at Monument Headquarters	08/22	UF	DUP		< 1.04		< 0.0028		18.8				
Frijoles at Monument Headquarters	08/22	F	CS	0.04				123					100
Frijoles at Monument Headquarters	08/22	UF	CS		< 1.04		< 0.0028		19.8		8.0		
Frijoles at Rio Grande	08/22	F	CS	< 0.01				126					103
Frijoles at Rio Grande	08/22	UF	CS		< 1.04		< 0.0028		2.6		8.2		
Water Quality Standards[g]													
EPA Primary Drinking Water Standard				10			0.20						
EPA Secondary Drinking Water Standard								500			6.8-8.5	6.8-8.5	
EPA Health Advisory													
NMWQCC Groundwater Limit				10			0.20	1,000			6-9	6-9	
NMWQCC Wildlife Habitat Standard						0.0052							

[a] Except where noted.
[b] Codes: UF–unfiltered; F–filtered; CS–customer sample; DUP–laboratory duplicate; TRP–laboratory triplicate.
[c] Total dissolved solids.
[d] Total suspended solids.
[e] Standard units.
[f] Less than symbol (<) means measurement was below the specified limit of detection of the analytical method.
[g] Standards given here for comparison only; see Appendix A.

Table 5-8. Trace Metals in Surface Water for 2000 (μg/L)

Station Name	Date	Code[a]		Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe	Hg
Regional Stations															
Rio Chama at Chamita (bank)	07/12	F	CS	<[b] 6.0	< 51.0	< 2.0	27.0	71.0	< 1.00	< 3.0	9.0	< 5.0	< 4.0	< 30.0	
Rio Chama at Chamita (bank)	07/12	UF	CS												< 0.10
Rio Grande at Embudo (bank)	07/12	F	CS	< 6.0	< 88.0	< 3.0	56.0	40.0	< 5.00	< 3.0	16.0	14.0	< 4.0	82.0	
Rio Grande at Embudo (bank)	07/12	UF	CS												< 0.10
Rio Grande at Otowi Upper (bank)	08/14	F	CS	< 6.0	44.0	2.0	< 30.0	80.0	< 1.00	< 3.0	< 8.0	< 5.0	< 4.0	< 30.0	
Rio Grande at Otowi Upper (bank)	08/14	UF	CS												< 0.10
Rio Grande at Otowi (bank)	08/14	F	CS	< 6.0	92.0	< 4.0	< 30.0	85.0	< 1.00	< 3.0	< 6.0	< 5.0	< 4.0	50.0	
Rio Grande at Otowi (bank)	08/14	UF	CS												< 0.10
Rio Grande at Frijoles (bank)	09/27	F	CS	< 0.5	38.7	< 2.6	39.4	104.0	0.51	< 0.1	4.6	< 1.1	< 1.8	< 19.9	
Rio Grande at Frijoles (bank)	09/27	UF	CS												< 0.06
Rio Grande at Cochiti	09/27	F	DUP	< 0.5	25.0	< 2.6	35.0	106.0	< 0.47		< 0.6	< 1.1	< 1.8	< 19.9	
Jemez River	07/13	F	CS	< 6.0	< 56.0		1,047.0	79.0	< 1.00	< 3.0	< 6.0	< 5.0	< 4.0	45.0	
Pajarito Plateau Stations															
Acid/Pueblo Canyons:															
Pueblo 1 R	07/25	F	CS	< 12.0	< 270.0	3.0	49.0	100.0	< 1.00	< 3.0	< 6.0	< 5.0	< 4.0	92.0	
Pueblo 1 R	07/25	UF	CS												< 0.10
Acid Weir	07/25	F	CS	7.0	< 270.0	< 3.0	33.0	54.0	< 2.00	< 3.0	< 6.0	< 5.0	< 4.0	< 30.0	
Acid Weir	07/25	UF	CS												< 0.10
Pueblo 3	07/25	F	CS	6.0	< 270.0	5.0	380.0	75.0	< 1.00	< 3.0	< 6.0	< 5.0	< 4.0	477.0	
Pueblo 3	07/25	UF	CS												< 0.10
Pueblo at SR-502	08/14	F	CS	< 6.0	< 40.0	12.0	308.0	10.0	< 1.00	< 3.0	15.0	< 5.0	< 4.0	370.0	
Pueblo at SR-502	08/14	UF	CS												< 0.10
Pueblo at SR-502	12/06	F	CS	1.4	427.3	8.5	722.0	61.6	0.51	< 0.1	15.0	< 1.1	16.1	515.0	
Pueblo at SR-502	12/06	F	DUP	< 0.5	71.2	3.8	366.0	29.4	0.51	< 0.1	5.8	< 1.1	7.1	148.0	
Pueblo at SR-502	12/06	UF	CS												< 0.06
Pueblo at SR-502	12/06	UF	DUP												< 0.06
DP/Los Alamos Canyons:															
DPS-1	10/25	F	CS	< 0.5	266.0	< 2.6	23.6	57.6	0.51	< 0.1	4.6	< 1.1	2.9	132.0	
DPS-1	10/25	F	DUP	< 0.5	263.0	< 2.6	24.6	58.5	< 0.47		4.8	< 1.1	3.0	131.0	
DPS-1	10/25	UF	CS												< 0.06
Sandia Canyon:															
SCS-2	08/16	F	CS	< 6.0	356.0	4.0	115.0	43.0	< 1.00	< 3.0	< 6.0	18.0	10.0	540.0	
SCS-2	08/16	UF	CS												0.10
Mortandad Canyon:															
Mortandad at GS-1	07/11	UF	CS	0.1	1,010.0	2.6		42.3	0.13	0.3	1.4	8.7	18.8	644.0	< 0.03
Mortandad at GS-1	07/11	F	CS	0.1	40.0	2.4		38.5	0.02	0.2	0.9	7.2	16.3	19.7	< 0.03
Mortandad at GS-1	08/16	F	CS	< 6.0	1,021.0	< 2.0	66.0	19.0	< 1.00	< 3.0	< 6.0	7.0	10.0	564.0	
Mortandad at GS-1	08/16	UF	CS												0.10
Mortandad at Rio Grande (A-11)	09/25	F	CS	< 0.5	32.7	< 2.6	572.0	61.1	0.49	< 0.1	2.6	< 1.1	16.7	< 19.9	
Mortandad at Rio Grande (A-11)	09/25	UF	CS												< 0.06
Cañada del Buey:															
Cañada del Buey	10/24	F	CS	0.6	929.0	< 2.6	32.3	72.2	0.49	< 0.1	7.4	1.1	5.7	569.0	
Cañada del Buey	10/24	UF	CS												< 0.06

Table 5-8. Trace Metals in Surface Water for 2000 (µg/L) (Cont.)

Station Name	Date	Code[a]		Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe	Hg
Pajarito Plateau Stations (Cont.)															
Pajarito Canyon:															
Pajarito Canyon	10/24	F	CS	0.6	659.0	3.1	41.6	80.5	0.51	< 0.1	4.3	0.8	2.6	452.0	
Pajarito Canyon	10/24	UF	CS												< 0.06
Pajarito Retention Pond	08/24	F	CS	< 0.5	57.0	5.5	48.5	152.0	0.51	< 0.1	< 0.6	< 1.1	2.4	136.0	
Pajarito Retention Pond	08/24	UF	CS	< 0.5	14,900.0	9.1	47.3	468.0	1.12	0.4	6.8	6.6	14.0	8,430.0	0.14
Pajarito at Rio Grande	09/26	F	CS	< 0.5	< 23.4	< 2.6	29.6	41.3	0.51	< 0.1	1.6	3.6	< 1.8	< 19.9	
Pajarito at Rio Grande	09/26	F	DUP						< 0.03	< 0.1					
Pajarito at Rio Grande	09/26	UF	CS												< 0.06
Pajarito at Rio Grande	09/26	UF	DUP												
Water Canyon:															
Water Canyon at Beta	08/17	F	CS	< 6.0	61.0	< 2.0	24.0	211.0	< 1.00	< 3.0	< 6.0	< 5.0	< 4.0	41.0	
Water Canyon at Beta	08/17	UF	CS												< 0.10
Ancho Canyon:															
Ancho at Rio Grande	09/26	F	CS	< 0.5	< 23.4	< 2.6	< 4.7	30.0	0.49	< 0.1	< 0.6	< 1.1	< 1.8	10.3	
Ancho at Rio Grande	09/26	UF	CS												< 0.06
Ancho at Rio Grande	09/26	F	CS	< 0.5	< 23.4	< 2.6	7.3	29.2	0.51	< 0.1	< 0.6	< 1.1	< 1.8	< 19.9	
Ancho at Rio Grande	09/26	UF	CS												
Frijoles Canyon:															
Frijoles at Monument Headquarters	08/22	F	CS	< 0.5	23.4	< 2.6	5.1	17.6	0.51	< 0.1	1.2	< 1.1	< 1.8	86.1	
Frijoles at Monument Headquarters	08/22	F	DUP	< 0.5	609.0	< 2.6	27.9	25.4	0.51	< 0.1	12.9	< 1.1	< 1.8	562.0	
Frijoles at Monument Headquarters	08/22	UF	CS												< 0.06
Frijoles at Monument Headquarters	08/22	UF	DUP												< 0.06
Frijoles at Monument Headquarters	08/22	F	CS	< 0.5	15.6	3.3	8.0	17.9	0.51	< 0.1	< 0.6	< 1.1	< 1.8	93.9	
Frijoles at Monument Headquarters	08/22	UF	CS												< 0.06
Frijoles at Rio Grande	08/22	F	CS	< 0.5	23.4	3.5	4.9	20.4	0.51	< 0.1	< 0.6	< 1.1	< 1.8	82.6	
Frijoles at Rio Grande	08/22	UF	CS												< 0.06
Water Quality Standards[c]															
EPA Primary Drinking Water Standard						50		2,000	4	5		100			2
EPA Secondary Drinking Water Standard					50-200									300	
EPA Action Level													1,300		
EPA Health Advisory															
NMWQCC Livestock Watering Standard					5,000	200	5,000			50	1,000	1,000	500		10
NMWQCC Groundwater Limit				50	5,000	100	750	1,000		10	50	50	1,000	1,000	2
NMWQCC Wildlife Habitat Standard															0.77

Table 5-8. Trace Metals in Surface Water for 2000 (µg/L) (Cont.)

Station Name	Date	Code[a]		Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn
Regional Stations														
Rio Chama at Chamita (bank)	07/12	F	CS	5.0	< 10.0	< 20.0	< 2.00	< 3.00		< 60.0	289.0		< 7.0	< 10.0
Rio Chama at Chamita (bank)	07/12	UF	CS						< 3.0					
Rio Grande at Embudo (bank)	07/12	F	CS	30.0	13.0	20.0	< 10.00	< 3.00		< 60.0	243.0		7.0	38.0
Rio Grande at Embudo (bank)	07/12	UF	CS						< 3.0					
Rio Grande at Otowi Upper (bank)	08/14	F	CS	3.0	< 130.0	< 40.0	< 2.00	< 3.00		< 60.0	294.0		< 7.0	< 10.0
Rio Grande at Otowi Upper (bank)	08/14	UF	CS						3.0					
Rio Grande at Otowi (bank)	08/14	F	CS	15.0	< 130.0	< 40.0	< 2.00	3.00		< 60.0	302.0		< 7.0	< 10.0
Rio Grande at Otowi (bank)	08/14	UF	CS						3.0					
Rio Grande at Frijoles (bank)	09/27	F	CS	7.6	3.6	1.5	0.12	< 0.11		< 2.0	366.0	0.03	3.1	2.8
Rio Grande at Frijoles (bank)	09/27	UF	CS						< 2.4					
Rio Grande at Cochiti	09/27	F	DUP	39.8	3.5	< 3.1			< 2.4	< 2.0	362.0		3.7	< 3.9
Jemez River	07/13	F	CS	9.0	< 10.0	< 20.0				< 60.0	198.0		< 7.0	< 10.0
Pajarito Plateau Stations														
Acid/Pueblo Canyons:														
Pueblo 1 R	07/25	F	CS	842.0	< 10.0	< 20.0	< 2.00	3.00		< 60.0	196.0		< 7.0	< 10.0
Pueblo 1 R	07/25	UF	CS						< 3.0					
Acid Weir	07/25	F	CS	58.0	< 10.0	< 20.0	< 2.00	3.00		< 60.0	169.0		< 7.0	< 10.0
Acid Weir	07/25	UF	CS						< 3.0					
Pueblo 3	07/25	F	CS	2,326.0	< 10.0	< 52.0	< 2.00	< 3.00		< 60.0	179.0		< 7.0	< 10.0
Pueblo 3	07/25	UF	CS						< 3.0					
Pueblo at SR-502	08/14	F	CS	2,240.0	< 130.0	< 40.0	< 5.00	< 3.00		< 60.0	136.0		< 13.0	18.0
Pueblo at SR-502	08/14	UF	CS						4.0					
Pueblo at SR-502	12/06	F	CS	284.0	11.5	12.8	0.46	0.76		< 2.0	214.0	0.13	14.3	56.4
Pueblo at SR-502	12/06	F	DUP	141.0	5.5	6.2	0.41	0.56		< 2.0	111.0	< 0.01	7.3	26.9
Pueblo at SR-502	12/06	UF	CS						< 2.4					
Pueblo at SR-502	12/06	UF	DUP						< 2.4					
DP/Los Alamos Canyons:														
DPS-1	10/25	F	CS	11.8	1.9	2.2	0.44	0.80		< 2.0	95.7	< 0.01	2.0	14.1
DPS-1	10/25	F	DUP	10.5	1.5	2.1				< 2.0	98.3		1.9	13.0
DPS-1	10/25	UF	CS						< 2.4					
Sandia Canyon:														
SCS-2	08/16	F	CS	21.0	304.0	< 20.0	< 5.00	3.00		60.0	117.0		12.0	42.0
SCS-2	08/16	UF	CS						4.0					
Mortandad Canyon:														
Mortandad at GS-1	07/11	UF	CS	16.0		14.4	0.53	< 0.68	1.4			0.22	5.8	29.4
Mortandad at GS-1	07/11	F	CS	3.0		13.0	0.06	< 0.68	1.6			0.22	4.5	21.3
Mortandad at GS-1	08/16	F	CS	7.0	97.0	< 20.0	< 2.00	3.00		60.0	42.0		< 7.0	17.0
Mortandad at GS-1	08/16	UF	CS						3.0					
Mortandad at Rio Grande (A-11)	09/25	F	CS	13.4	< 1.1	3.3	0.37	< 0.11		< 2.0	123.0	0.03	7.9	39.7
Mortandad at Rio Grande (A-11)	09/25	UF	CS						< 2.4					
Cañada del Buey:														
Cañada del Buey	10/24	F	CS	85.5	84.5	4.0	0.46	0.18		2.4	87.2	0.02	2.6	12.0
Cañada del Buey	10/24	UF	CS						< 2.4					

Table 5-8. Trace Metals in Surface Water for 2000 (µg/L) (Cont.)

Station Name	Date	Code[a]		Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn
Pajarito Plateau Stations (Cont.)														
Pajarito Canyon:														
Pajarito Canyon	10/24	F	CS	142.0	1.5	3.3	0.44	0.36		2.4	175.0	0.02	4.1	7.7
Pajarito Canyon	10/24	UF	CS						< 2.4					
Pajarito Retention Pond	08/24	F	CS	1,080.0	3.5	2.1	0.09	< 0.68		2.2	235.0	< 0.01	6.9	2.8
Pajarito Retention Pond	08/24	UF	CS	1,860.0	2.7	8.5	23.70	< 0.68	2.4	< 2.0	301.0	0.13	19.6	49.5
Pajarito at Rio Grande	09/26	F	CS	2.4	< 1.1	< 3.1	< 0.08	< 0.11		< 2.0	129.0	0.26	9.9	6.5
Pajarito at Rio Grande	09/26	F	DUP				< 0.08	< 0.11				< 0.01		
Pajarito at Rio Grande	09/26	UF	CS						< 2.4					
Pajarito at Rio Grande	09/26	UF	DUP						< 2.4					
Water Canyon:														
Water Canyon at Beta	08/17	F	CS	43.0	< 10.0	< 20.0	< 2.00	< 3.00		< 60.0	172.0		< 7.0	< 10.0
Water Canyon at Beta	08/17	UF	CS						3.0					
Ancho Canyon:														
Ancho at Rio Grande	09/26	F	CS	2.1	< 1.1	< 3.1	< 0.08	< 0.11		< 2.0	70.4	0.38	5.1	2.3
Ancho at Rio Grande	09/26	UF	CS						< 2.4					
Ancho at Rio Grande	09/26	F	CS	< 1.2	< 1.1	< 3.1	< 0.08	< 0.11		< 2.0	68.8	0.05	5.0	< 3.9
Ancho at Rio Grande	09/26	UF	CS						< 2.4					
Frijoles Canyon:														
Frijoles at Monument Headquarters	08/22	F	CS	14.2	< 1.1	< 3.1	< 0.08	0.11		< 2.0	52.3	0.30	4.0	< 3.9
Frijoles at Monument Headquarters	08/22	F	DUP	57.8	< 1.1	< 3.1	< 0.08	< 0.11		< 2.0	55.1	< 0.01	4.6	3.5
Frijoles at Monument Headquarters	08/22	UF	CS						< 2.4					
Frijoles at Monument Headquarters	08/22	UF	DUP						< 2.4					
Frijoles at Monument Headquarters	08/22	F	CS	10.0	< 1.1	< 3.1	< 0.08	0.11		< 2.0	53.1	0.08	4.2	< 3.9
Frijoles at Monument Headquarters	08/22	UF	CS						< 2.4					
Frijoles at Rio Grande	08/22	F	CS	16.9	< 1.1	< 3.1	< 0.08	0.11		< 2.0	57.6	0.36	3.4	< 3.9
Frijoles at Rio Grande	08/22	UF	CS						< 2.4					
Water Quality Standards[c]														
EPA Primary Drinking Water Standard						100		6	50			2		
EPA Secondary Drinking Water Standard				50										5,000
EPA Action Level							15							
EPA Health Advisory											25,000–90,000		80–110	
NMWQCC Livestock Watering Standard							100		50				100	25,000
NMWQCC Groundwater Limit				200	1,000	200	50		50					10,000
NMWQCC Wildlife Habitat Standard									5					

[a] Codes: UF–unfiltered; F–filtered; CS–customer sample; DUP–laboratory duplicate.

[b] Less than symbol (<) means measurement was below the specified limit of detection of the analytical method.

[c] Standards given here for comparison only; see Appendix A. Note that New Mexico Livestock Watering and Groundwater limits are based on dissolved concentrations, whereas many of these analyses are of unfiltered samples; thus, concentrations may include suspended sediment quantities.

Table 5-9. Number of Samples Collected for Each Suite of Organic Compounds in Surface Water and Runoff Samples in 2000

		Organic Suite[a]			
Station Name	**Date**	**HE**	**PCB**	**Semivolatile**	**Volatile**
Surface Water Samples:					
Acid Weir	07/25		1	1	1
Ancho at Rio Grande	09/26	2	2	1	2
Cañada del Buey	10/24		1	1	1
DI Blank	07/26		1	1	1
DPS-1	10/25		1	1	1
Frijoles at Monument Headquarters	08/22	2	2	2	2
Frijoles at Rio Grande	08/22	1	1	1	1
Mortandad at GS-1	07/11		1		
Organics Trip Blank	07/25				1
Organics Trip Blank	09/25				1
Organics Trip Blank	09/26				1
Organics Trip Blank	09/27				1
Organics Trip Blank	10/24				1
Pajarito at Rio Grande	09/26	1	1	1	1
Pajarito Canyon	10/24	1	1	1	1
Pajarito Retention Pond	10/11	1	1	1	
Pueblo 1 R	07/25		1	1	1
Pueblo 3	07/25		1	1	1
Runoff Samples:					
Area J	08/09		1		
Area L	07/17		1	2	
Area L	10/07		1		
Cañada del Buey at White Rock, NM	07/29		1	1	
Cañada del Buey at White Rock, NM	10/23	1		1	
Cañada del Buey at White Rock, NM	10/28	1			
Cañon del Valle above Highway 501	06/28	1	1	1	
Cañon del Valle above Highway 501	10/23	1	1	1	1
DP Canyon at Mouth	06/02		1	1	
DP Canyon below Meadow at TA-21	07/25			1	
G-1	10/11		1		
G-2	07/29	1	1		
G-2	08/09	1	1	1	
G-2	10/11		1		
G-3	08/09		1		
G-3	08/18	1	1	1	1
G-3	10/11		1		
G-4	10/12			1	
G-6	07/29	1	1	1	
G-6	08/09		1		
Guaje at SR-502	07/09	1	1	1	
Guaje at SR-502	09/08	1	1	1	1
Los Alamos Canyon at Los Alamos, NM	06/03		1	1	
Los Alamos Canyon at Los Alamos, NM	07/18		1	1	
Los Alamos Canyon at Los Alamos, NM	09/12	1	1	1	1
Los Alamos Canyon below Laboratory Technical Area (TA) 2 near Los Alamos, NM	06/02		1	1	
Los Alamos Canyon near Los Alamos, NM	06/03		1	1	
Los Alamos Canyon near Los Alamos, NM	07/09	1	1	1	
Los Alamos Canyon near Los Alamos, NM	10/23			1	

Table 5-9. Number of Samples Collected for Each Suite of Organic Compounds in Surface Water and Runoff Samples in 2000 (Cont.)

		Organic Suite[a]			
Station Name	**Date**	**HE**	**PCB**	**Semivolatile**	**Volatile**
Los Alamos Reservoir	08/31	1	1	1	
Los Alamos Weir	07/21		1	1	
Pajarito Canyon above Highway 4 near White Rock, NM	06/28	1	1	1	
Pajarito Canyon above Highway 4 near White Rock, NM	10/24	1	1	1	1
Pajarito Canyon above Highway 4 near White Rock, NM	10/27	1			
Pajarito Canyon above Highway 501 near Los Alamos, NM	06/28	1	1	1	
Pajarito Canyon above Highway 501 near Los Alamos, NM	09/08	1	1	1	1
Pajarito Canyon above Highway 501 near Los Alamos, NM	10/23	1	1	1	1
Pajarito Canyon at TA-22	06/28		1		
Pajarito SR-4 Culvert	06/28	1	1	1	
Potrillo Canyon near White Rock, NM	08/09		1		
Sandia Canyon near Roads & Grounds at TA-3	07/16		1		
Starmer’s Gulch above Highway 501	10/23	1		1	1
Starmers Gulch at TA-22	06/28		1	1	
TA-18 Culvert	06/28		1	1	
Two-Mile at Highway 501	10/23	1	1	1	1
Upper Los Alamos Reservoir	08/31	1	1	1	
Water Canyon above Highway 501 near Los Alamos, NM	06/28			1	
Water Canyon above Highway 501 near Los Alamos, NM	10/23	1	1	1	1
Water Canyon at Highway 4	06/28	1	1	1	
Water Canyon at Highway 4	10/27	1		1	
Water Canyon below Highway 4 near White Rock, NM	06/28	1	1	1	
Water Canyon below Highway 4 near White Rock, NM	07/29	1	1		
Water Canyon below Highway 4 near White Rock, NM	08/12	1			
Water Canyon below Highway 4 near White Rock, NM	08/18	1	1	1	1
Water Canyon below Highway 4 near White Rock, NM	10/23	1	1	1	1

[a] High explosives, polychlorinated biphenyls, semivolatiles, and volatiles.

Table 5-10. Organic Compounds Detected in Surface Water Samples in 2000

Detect[a]	Station Name	Date	Code[b]	Suite[c]	Analyte	Result	MDL[d]	Units	Lab Code
	Organics Trip Blank	07/25	UF	VOA	Toluene	2.20		µg/L	PARA
	Pueblo 3	07/25	UF	VOA	Toluene	1.20		µg/L	PARA
Detect	Pueblo 3	07/25	UF	VOA	Acetone	10.00		µg/L	PARA
	Acid Weir	07/25	UF	VOA	Chloroform	0.33		µg/L	PARA
	Organics Trip Blank	07/25	UF	VOA	Chloroform	2.80		µg/L	PARA
	Organics Trip Blank	07/25	UF	VOA	Chloroethane	4.60		µg/L	PARA
	Organics Trip Blank	07/25	UF	VOA	Methylene chloride	16.00		µg/L	PARA
	Pueblo 1	07/25	UF	VOA	Methylene chloride	14.00		µg/L	PARA
	Pueblo 3	07/25	UF	VOA	Methylene chloride	1.30		µg/L	PARA
	Acid Weir	07/25	UF	VOA	Methylene chloride	15.00		µg/L	PARA
	Organics Trip Blank	07/25	UF	VOA	Bromodichloromethane	0.74		µg/L	PARA
	DI Blank	07/26	UF	SVOA	Bis(2-ethylhexyl)phthalate	2.80		µg/L	PARA
	DI Blank	07/26	UF	VOA	Methylene chloride	15.00		µg/L	PARA
	Organics Trip Blank	09/25	UF	VOA	Chloroform	6.10	0.198	µg/L	GELC
	Organics Trip Blank	09/25	UF	VOA	Bromodichloromethane	1.60	0.024	µg/L	GELC
	Organics Trip Blank	09/26	UF	VOA	Chloroform	6.10	0.198	µg/L	GELC
	Organics Trip Blank	09/26	UF	VOA	Bromodichloromethane	1.50	0.024	µg/L	GELC
	Organics Trip Blank	09/27	UF	VOA	Chloroform	5.30	0.198	µg/L	GELC
	Organics Trip Blank	09/27	UF	VOA	Bromodichloromethane	1.30	0.024	µg/L	GELC
	Organics Trip Blank	10/24	UF	VOA	Chloroform	6.70	0.198	µg/L	GELC
	Organics Trip Blank	10/24	UF	VOA	Bromodichloromethane	1.60	0.024	µg/L	GELC

[a] Indicates compound was not detected in associated blank. Results are sorted by analyte and date to show association of field blanks with samples.
[b] UF–unfiltered; F–filtered.
[c] PEST/PCB–pesticides and polychlorinated biphenyls; SVOA–semivolatile organics; VOA–volatile organics.
[d] Method detection limit.

Table 5-11. Radiochemical Analysis of Runoff Samples for 2000 (pCi/L[a])

Station Name	Date	Codes[b]		^{3}H			^{90}Sr			^{137}Cs			^{234}U			^{235,236}U			^{238}U			U (µg/L)
Runoff Stations																						
Los Alamos Canyon (includes Pueblo, DP Canyons):																						
Los Alamos Canyon at Los Alamos	06/03	F	CS	80	30	190	3.04	0.15	0.29	-0.10	0.73	5.00	1.040	0.053	0.058	0.041	0.008	0.016	1.090	0.055	0.033	3.50
Los Alamos Canyon at Los Alamos	06/03	UF	CS	120	30	190	4.34	0.21	0.33	5.00	0.58	2.30	1.450	0.065	0.048	0.067	0.011	0.057	1.580	0.070	0.041	4.48
Los Alamos Canyon at Los Alamos	07/18	F	CS																			4.74
Los Alamos Canyon at Los Alamos	07/18	UF	CS																			21.50
Los Alamos Canyon at Los Alamos	07/18	UF	DUP																			26.00
Los Alamos Canyon at Los Alamos	07/18	F	CS				4.24	0.43	0.39	0.00	2.00	3.00	2.000	0.195	0.070	0.460	0.070	0.061	2.000	0.195	0.061	
Los Alamos Canyon at Los Alamos	07/18	F	DUP										2.000			0.203			1.000			
Los Alamos Canyon at Los Alamos	07/18	UF	CS	20	55	180																
Los Alamos Canyon at Los Alamos	07/18	UF	TOTC				19.80			34.00	3.00		16.000	1.000		2.000			18.000	1.000		
Los Alamos Canyon at Los Alamos	07/18	UF	CS																			
Los Alamos Canyon at Los Alamos	07/18	UF	TOTC				38.90			102.00	10.00		47.000	3.500		4.000	0.500		52.000	4.000		
Los Alamos Canyon at Los Alamos	09/12	F	CS				3.40	0.36	0.21	1.75	1.93	7.06	0.661	0.100	0.101	0.011	0.011	0.030	0.634	0.097	0.080	1.51
Los Alamos Canyon at Los Alamos	09/12	F	DUP				3.33	0.13	0.24				0.730	0.105	0.110	0.026	0.023	0.110	0.603	0.093	0.095	
Los Alamos Canyon at Los Alamos	09/12	UF	CS	-91	57	199	2.98	0.20	0.40	5.42	2.81	7.49	1.940	0.183	0.097	0.072	0.029	0.091	1.780	0.171	0.051	2.82
Los Alamos Canyon at Los Alamos	09/12	UF	DUP	-122	56	201																
Los Alamos Canyon below TA 2	06/02	UF	CS	100	30	190	1.63	0.09	0.33	0.00	0.35	2.50	3.830	0.150	0.063	0.360	0.025	0.034	3.460	0.138	0.056	6.94
Los Alamos Canyon below TA 2	10/23	UF	CS																			0.99
DP Canyon below Meadow at TA-21	07/25	F	CS																			0.08
DP Canyon below Meadow at TA-21	07/25	UF	CS																			0.67
DP Canyon below Meadow at TA-21	10/23	UF	CS																			1.62
DP Canyon below Meadow at TA-21	10/27	F	CS																			0.08
DP Canyon below Meadow at TA-21	10/27	F	DUP																			0.05
DP Canyon below Meadow at TA-21	10/27	UF	CS																			2.05
DP Canyon at Mouth	06/02	UF	CS	140	30	190	23.90	1.08	0.35	14.20	1.23	5.50	3.540	0.145	0.053	0.258	0.022	0.018	2.280	0.100	0.038	4.82
DP Canyon at Mouth	10/12	UF	CS				23.80	1.04	0.55	6.21	1.90	4.58	4.320	0.423	0.106	0.115	0.042	0.039	2.700	0.292	0.133	
DP Canyon at Mouth	10/23	UF	CS																			2.62
DP Canyon at Mouth	10/27	F	CS				7.33	0.31	0.48	0.41	1.56	2.19	0.052	0.022	0.075	0.000	0.009	0.065	0.017	0.013	0.051	0.05
DP Canyon at Mouth	10/27	F	DUP																			
DP Canyon at Mouth	10/27	UF	CS	-29	57	193																5.40
Los Alamos Canyon near Los Alamos	06/02	UF	CS	130	30	190	25.20	1.15	0.42	13.90	0.88	4.30	7.900	0.325	0.110	0.560	0.040	0.092	6.200	0.250	0.087	10.20
Los Alamos Canyon near Los Alamos	06/03	F	CS	30	28	190	3.54	0.17	0.32	0.20	0.75	5.20	1.060	0.053	0.066	0.099	0.013	0.052	1.120	0.055	0.066	3.44
Los Alamos Canyon near Los Alamos	06/03	UF	CS	150	30	190	6.80	0.33	0.33	21.80	1.95	6.00	2.550	0.108	0.057	0.235	0.021	0.057	2.610	0.110	0.061	6.35
Los Alamos Canyon near Los Alamos	06/03	UF	DUP																			
Los Alamos Canyon near Los Alamos	07/09	UF	CS	-100	55	190																68.40
Los Alamos Canyon near Los Alamos	07/09	UF	DUP	-90	55	190																
Los Alamos Canyon near Los Alamos	07/09	UF	TOTC							106.58			26.042			1.731			36.411			
Los Alamos Canyon near Los Alamos	07/09	F	CS							-1.00	1.55	2.60	1.040	0.080	0.023	0.096	0.017	0.018	1.320	0.100	0.026	4.05
Los Alamos Canyon near Los Alamos	07/09	F	DUP										1.140	0.085	0.006	0.061	0.015	0.033	1.340	0.100	0.006	
Los Alamos Canyon near Los Alamos	10/17	UF	CS				10.90	0.63	0.88	4.25	2.10	4.50	0.771	0.096	0.071	0.054	0.021	0.021	0.500	0.073	0.082	
Los Alamos Canyon near Los Alamos	10/23	F	CS				4.60	0.47	1.23	3.33	1.46	2.52	0.045	0.021	0.069	0.000	1.000	0.020	0.015	0.011	0.020	0.03
Los Alamos Canyon near Los Alamos	10/23	F	DUP																			
Los Alamos Canyon near Los Alamos	10/23	UF	CS	30	59	194	9.94	1.29	0.56	18.80	1.99	3.47	5.860	0.471	0.084	0.214	0.042	0.052	5.770	0.465	0.019	2.98
Los Alamos Canyon near Los Alamos	10/27	F	CS																			0.22
Los Alamos Canyon near Los Alamos	10/27	UF	CS	-29	56	190	11.20	0.44	0.54	15.00	2.25	4.23	8.720	0.951	0.312	0.851	0.216	0.511	8.920	0.967	0.115	
Los Alamos Canyon near Los Alamos	10/27	UF	DUP	-29	56	191																
Pueblo Canyon near Los Alamos	10/23	F	CS																			1.34
Pueblo Canyon near Los Alamos	10/23	UF	CS				10.80	0.52	0.99	9.14	1.58	3.81	14.100	1.280	0.254	0.673	0.148	0.202	15.700	1.410	0.386	9.78
Pueblo Canyon near Los Alamos	10/23	UF	DUP																			
Pueblo Canyon near Los Alamos	10/27	F	CS				1.62	0.18	0.54	1.12	0.84	3.10	0.297	0.057	0.102	0.013	0.013	0.063	0.276	0.053	0.063	
Pueblo Canyon near Los Alamos	10/27	UF	CS	-89	56	195	5.40	0.31	0.55	4.43	2.06	3.22	17.000	1.760	0.418	1.080	0.265	0.155	18.000	1.850	0.528	

Table 5-11. Radiochemical Analysis of Runoff Samples for 2000 (pCi/L[a]) (Cont.)

Station Name	Date	Codes[b]		^{3}H			^{90}Sr			^{137}Cs			^{234}U			^{235,236}U			^{238}U			U (µg/L)
Runoff Stations (Cont.)																						
Sandia Canyon:																						
Sandia Canyon at TA-3	07/17	UF	CS																			0.87
Sandia Canyon at TA-3	07/17	UF	CS	100	55	180	0.15	0.12	0.39	0.00	2.50	4.00	0.760	0.065	0.032	0.064	0.014	0.024	0.860	0.070	0.017	
Sandia Canyon at TA-3	07/17	UF	DUP																			
Sandia Canyon at TA-3	10/17	UF	CS				0.51	0.18	0.58	0.58	1.62	5.01	0.058	0.023	0.074	0.017	0.012	0.051	0.051	0.020	0.050	
Sandia Canyon at TA-3	10/17	UF	DUP										0.055	0.018	0.015	-0.003	0.007	0.060	0.042	0.016	0.041	
Mortandad Canyon (includes Ten Site Canyon, Cañada del Buey):																						
TA-55	07/17	UF	CS																			0.46
TA-55	07/17	UF	CS	10	55	180	0.00	0.12	0.40	2.00	2.50	4.00	0.205	0.028	0.023	0.075	0.016	0.019	0.286	0.034	0.019	
TA-55	10/07	F	CS							4.23	1.53	2.06										
TA-55	10/07	F	DUP										0.053	0.031	0.147	-0.018	0.015	0.118	0.000	0.012	0.085	
TA-55	10/07	UF	CS	-69	47	161				0.39	0.72	2.69										0.15
TA-55	10/07	UF	DUP				0.32	0.21	0.69	0.53	0.87	3.34										0.15
Cañada del Buey near TA-46	10/23	UF	CS																			18.00
TA-54 MDA J	08/09	UF	CS																			3.21
TA-54 MDA J	08/09	UF	DUP																			3.33
TA-54 MDA J	07/15	UF	CS																			0.21
TA-54 MDA J	07/17	F	CS																			0.04
TA-54 MDA J	07/17	UF	CS																			0.15
TA-54 MDA J	07/17	UF	CS	110	55	180	0.04	0.12	0.40	0.00	2.00	3.00	0.091	0.037	0.094	0.010	0.018	0.065	0.059	0.029	0.077	
TA-54 MDA J	10/07	UF	CS	-79	51	175				1.12	1.61	2.21										0.11
TA-54 MDA G-6	07/29	F	CS				0.21	0.10	0.16	0.25	0.62	2.24	0.069	0.021	0.016	-0.003	0.008	0.054	0.021	0.014	0.054	0.20
TA-54 MDA G-6	07/29	F	DUP										0.094	0.023	0.014	0.016	0.009	0.014	0.047	0.016	0.014	
TA-54 MDA G-6	07/29	UF	CS	500	67	183	0.75	0.39	0.63	0.00	0.76	2.95	7.770	0.580	0.044	0.365	0.050	0.044	7.920	0.591	0.044	5.37
TA-54 MDA G-6	07/29	UF	DUP	388	64	182																
TA-54 MDA G-6	08/18	F	CS				0.27	0.20	0.33	0.12	0.93	3.26	0.029	0.025	0.128	0.000	0.013	0.089	0.048	0.022	0.079	0.14
TA-54 MDA G-6	08/18	UF	CS	1,730	147	369	0.26	0.17	0.27	7.05	1.64	3.40	0.584	0.078	0.130	0.026	0.019	0.092	0.662	0.082	0.078	2.61
TA-54 MDA G-6	08/18	UF	DUP	1,710	141	349																2.61
TA-54 MDA G-6	10/11	F	CS				3.34	0.46	0.50	0.55	0.62	2.29	0.073	0.026	0.098	-0.003	0.008	0.063	0.041	0.017	0.055	0.11
TA-54 MDA G-6	10/11	F	DUP										0.045	0.018	0.044	-0.003	0.003	0.045	0.060	0.021	0.056	
TA-54 MDA G-6	10/11	UF	CS	1,870	101	209	0.17	0.18	0.59	5.70	2.03	3.65	9.160	1.140	0.839	0.544	0.226	0.246	7.650	1.010	0.665	2.50
TA-54 MDA G-6	10/11	UF	DUP										10.700	1.260	0.667	0.191	0.165	0.978	10.600	1.260	0.975	2.54
Cañada del Buey at White Rock	07/29	UF	CS	-112	52	185																15.70
Cañada del Buey at White Rock	07/29	F	CS																			0.31
Cañada del Buey at White Rock	08/09	UF	CS				-0.14	0.27	0.46	0.79	0.91	3.25	25.900	2.320	0.414	1.450	0.308	0.415	26.900	2.400	0.522	
Cañada del Buey at White Rock	08/18	F	CS				0.30	0.24	0.39	-0.72	0.81	2.70	0.003	0.016	0.101	-0.022	0.008	0.091	0.036	0.017	0.056	0.07
Cañada del Buey at White Rock	08/18	F	DUP							0.83	0.83	2.91										
Cañada del Buey at White Rock	08/18	UF	CS	-69	103	351	0.34	0.19	0.30	-0.14	1.20	4.19	9.840	0.977	0.487	0.430	0.126	0.286	10.400	1.020	0.226	9.58
Cañada del Buey at White Rock	08/18	UF	DUP				0.89	0.25	0.38													
Cañada del Buey at White Rock	10/11	UF	CS																			2.80
Cañada del Buey at White Rock	10/23	UF	CS	-61	57	196	0.63	0.31	1.03	4.39	1.89	3.33	14.400	1.200	0.204	0.942	0.152	0.140	14.200	1.190	0.140	4.01
Cañada del Buey at White Rock	10/28	F	CS																			0.11
Cañada del Buey at White Rock	10/28	UF	CS																			1.76

Table 5-11. Radiochemical Analysis of Runoff Samples for 2000 (pCi/L[a]) (Cont.)

Station Name	Date	Codes[b]		^{3}H			^{90}Sr			^{137}Cs			^{234}U			^{235,236}U			^{238}U			U (µg/L)
Runoff Stations (Cont.)																						
Pajarito Canyon (includes Two-Mile, Three-Mile Canyons):																						
Pajarito Canyon above Highway 501	06/28	F	CS				3.42	0.35	0.41	-0.20	2.65	4.50	1.370	0.155	0.033	0.161	0.046	0.076	1.320	0.155	0.057	3.74
Pajarito Canyon above Highway 501	06/28	UF	CS	-10	60	190																
Pajarito Canyon above Highway 501	06/28	UF	TOTC				59.20	4.50		109.00			31.200	2.150		1.982			33.104			
Pajarito Canyon above Highway 501	09/08	F	CS				1.53	0.14	0.32	2.34	1.93	7.03	0.249	0.046	0.086	0.036	0.019	0.066	0.173	0.040	0.097	0.43
Pajarito Canyon above Highway 501	09/08	F	DUP							0.94	2.05	7.35										
Pajarito Canyon above Highway 501	09/08	UF	CS	-120	56	198	6.09	0.67	0.29	31.60	5.93	7.71	8.030	0.679	0.150	0.245	0.065	0.129	7.910	0.671	0.167	12.70
Pajarito Canyon above Highway 501	09/08	UF	DUP							30.50	2.62	3.00										13.90
Pajarito Canyon above Highway 501	10/23	F	CS				1.36	0.24	0.71	-0.90	0.50	1.67	0.167	0.047	0.144	0.014	0.019	0.103	0.134	0.039	0.089	0.41
Pajarito Canyon above Highway 501	10/23	F	DUP				1.95	0.17	0.46													
Pajarito Canyon above Highway 501	10/23	UF	CS	-30	57	194	2.93	0.32	0.87	0.00	1.68	3.50	0.408	0.079	0.093	0.000	0.016	0.117	0.352	0.074	0.117	1.21
Pajarito Canyon above Highway 501	10/23	UF	DUP							1.87	2.82	3.90										1.20
Pajarito Canyon at TA-22	06/28	F	CS				2.42	0.25	0.34	0.30	2.65	4.40	1.010	0.110	0.058	0.148	0.037	0.058	0.790	0.095	0.058	2.60
Pajarito Canyon at TA-22	06/28	UF	CS	0	60	190																
Pajarito Canyon at TA-22	06/28	UF	DUP	60	60	190																
Pajarito Canyon at TA-22	06/28	UF	TOTC				8.11	0.67		1.56			5.120	0.300		0.387			4.509			
Starmers Gulch at TA-22	06/28	F	CS				3.18	0.32	0.36	1.20	2.70	4.40	1.060	0.115	0.052	0.260	0.049	0.043	0.950	0.105	0.052	3.24
Starmers Gulch at TA-22	06/28	UF	CS	-10	60	190																
Starmers Gulch at TA-22	06/28	UF	TOTC				15.33	1.25		1.2			4.540	0.280		0.619			5.037			
TA-54 MDA G-1	10/11	F	CS																			0.06
TA-54 MDA G-1	10/11	UF	CS	-180	57	209	0.59	0.18	0.60	0.68	1.03	3.68	0.364	0.060	0.072	0.043	0.020	0.057	0.441	0.068	0.093	1.91
TA-54 MDA G-2	07/29	F	CS				0.38	0.16	0.25	0.04	0.64	2.28	0.108	0.025	0.043	0.028	0.012	0.013	0.061	0.018	0.034	0.16
TA-54 MDA G-2	07/29	F	DUP																			
TA-54 MDA G-2	07/29	UF	CS	303	62	182	1.00	0.22	0.32	0.00	0.98	3.76	4.240	0.353	0.111	0.261	0.052	0.111	4.370	0.363	0.122	2.95
TA-54 MDA G-2	08/09	F	CS				0.31	0.24	0.39	-0.57	0.82	2.80	0.038	0.024	0.100	-0.007	0.005	0.127	0.079	0.034	0.100	0.13
TA-54 MDA G-2	08/09	F	DUP										0.140	0.048	0.187	-0.006	0.005	0.124	0.090	0.036	0.098	
TA-54 MDA G-2	08/09	UF	CS	0	54	180	0.87	0.29	0.46	-1.85	1.21	3.86	12.400	1.300	0.169	0.251	0.127	0.170	12.900	1.340	0.169	5.35
TA-54 MDA G-2	08/09	UF	DUP				0.10	0.32	0.53	-0.40	0.97	3.35										
TA-54 MDA G-2	10/11	F	CS				1.14	0.23	0.72	62.40	2.33	2.33	0.056	0.028	0.113	0.000	0.017	0.114	0.064	0.029	0.113	0.20
TA-54 MDA G-2	10/11	UF	CS	864	81	207	0.78	0.17	0.55	2.92	1.15	4.25	0.344	0.070	0.138	0.017	0.017	0.085	0.327	0.068	0.124	1.61
TA-54 MDA G-3	07/29	UF	CS																			11.10
TA-54 MDA G-3	08/09	UF	CS				2.11	0.33	0.45	1.18	0.85	3.05	77.700	6.910	0.935	3.360	0.549	1.040	72.900	6.500	0.380	
TA-54 MDA G-3	08/18	F	CS				0.21	0.21	0.34	4.15	1.51	3.13	0.099	0.032	0.109	0.005	0.017	0.109	0.109	0.032	0.087	0.26
TA-54 MDA G-3	08/18	F	DUP																			
TA-54 MDA G-3	08/18	UF	CS	493	0	371	0.80	0.24	0.36		1.01	3.50	21.100	1.940	0.418	0.819	0.189	0.375	19.400	1.800	0.741	1.16
TA-54 MDA G-3	08/18	UF	DUP																			
TA-54 MDA G-3	10/11	F	CS																			0.50
TA-54 MDA G-3	10/11	UF	CS	603	77	209	0.79	0.19	0.58	0.46	1.15	4.11	0.515	0.076	0.095	0.032	0.019	0.074	0.460	0.071	0.112	1.58
TA-54 MDA G-3	10/25	F	CS																			0.15
TA-54 MDA G-3	10/25	UF	CS																			1.19
TA-54 MDA G-3	10/28	F	CS				0.01	0.20	0.69	0.75	0.77	2.86	0.068	0.022	0.057	0.025	0.012	0.017	0.025	0.015	0.057	0.11
TA-54 MDA G-3	10/28	F	DUP										0.075	0.023	0.018	0.027	0.014	0.018	0.010	0.010	0.050	
TA-54 MDA G-3	10/28	UF	CS	292	65	192	0.08	0.21	0.72	-1.39	1.11	3.63	0.335	0.067	0.084	0.000	0.014	0.106	0.176	0.048	0.084	
TA-54 MDA G-5	10/23	F	CS																			0.03
TA-54 MDA G-5	10/23	UF	CS	179	62	191	0.83	0.20	0.54	-0.45	1.03	3.49	0.263	0.051	0.074	0.004	0.009	0.059	0.179	0.041	0.059	0.37
TA-54 MDA G-4	08/15	UF	CS	-68	133	454				1.09	1.17	3.73										1.15
TA-54 MDA G-4	08/15	UF	DUP	86	154	510				-0.63	1.10	3.79										1.16
TA-54 MDA G-4	10/12	F	CS				1.28	0.20	0.59	0.00	1.44	6.05	0.089	0.025	0.055	0.057	0.020	0.044	0.065	0.020	0.016	0.18
TA-54 MDA G-4	10/12	F	DUP																			
TA-54 MDA G-4	10/12	UF	CS	440	71	204	1.28	0.29	0.62	2.02	0.90	3.05	0.174	0.038	0.086	-0.010	0.010	0.087	0.220	0.044	0.099	0.36
TA-54 MDA G-4	10/12	UF	DUP	122	66	211																

Table 5-11. Radiochemical Analysis of Runoff Samples for 2000 (pCi/L[a]) (Cont.)

Station Name	Date	Codes[b]		^{3}H			^{90}Sr				^{137}Cs			^{234}U			$^{235,236}U$			^{238}U			U (µg/L)
Runoff Stations (Cont.)																							
Pajarito Canyon (includes Two-Mile, Three-Mile Canyons): (Cont.)																							
Pajarito Canyon above Highway 4	06/28	F	CS				6.10	0.60	0.35		0.10	2.75	4.60	2.240	0.175	0.058	0.253	0.040	0.055	2.120	0.170	0.040	6.65
Pajarito Canyon above Highway 4	06/28	F	DUP				6.00	0.55	0.32														
Pajarito Canyon above Highway 4	06/28	UF	CS	-100	55	190					1.10	1.35	2.20				0.140	0.027	0.046	1.880	0.145	0.038	5.28
Pajarito Canyon above Highway 4	06/28	UF	TOTC				43.90	3.75			15.98			5.320	0.290		0.325			5.454			
Pajarito Canyon above Highway 4	10/24	F	CS				1.49	0.21	0.62	<	0.67	0.52	1.92	0.650	0.101	0.086	0.012	0.018	0.109	0.844	0.120	0.141	2.19
Pajarito Canyon above Highway 4	10/24	UF	CS				2.44	0.35	1.03	<	2.07	1.74	3.34	1.340	0.152	0.103	0.092	0.032	0.071	1.610	0.174	0.089	4.64
Pajarito Canyon above Highway 4	10/24	UF	DUP	-148	55	200								1.320	0.146	0.065	0.079	0.027	0.024	1.380	0.150	0.082	
Pajarito Canyon above Highway 4	10/27	F	CS				2.30	0.19	0.51		-0.15	0.75	2.69	0.855	0.097	0.048	0.032	0.017	0.060	0.968	0.106	0.078	3.63
Pajarito Canyon above Highway 4	10/27	UF	CS	-58	56	192	2.28	0.27	0.60		0.72	0.88	3.11	2.120	0.216	0.106	0.128	0.037	0.027	3.060	0.288	0.073	11.40
Water Canyon (includes Cañon del Valle, Potrillo, Fence, Indio Canyons):																							
Water Canyon above Highway 501	06/28	UF	CS	-40	55	190																	
Water Canyon above Highway 501	06/28	UF	TOTC				38.80	3.50			7.30			2.749	0.153		0.338			2.739			
Water Canyon above Highway 501	10/23	F	CS				5.07	0.55	1.35		1.26	1.48	1.97	0.336	0.054	0.050	0.020	0.017	0.082	0.234	0.046	0.089	0.75
Water Canyon above Highway 501	10/23	UF	CS	-60	56	193	13.30	0.96	1.59		14.30	2.38	3.48	32.300	3.010	0.790	1.450	0.319	0.691	29.800	2.800	0.143	1.54
Water Canyon above Highway 501	10/23	UF	DUP																				
Cañon del Valle above Highway 501	06/28	UF	CS	20	60	190																	
Cañon del Valle above Highway 501	06/28	UF	TOTC				48.20	4.20			15.38			4.380	0.295		0.276			4.511			
Cañon del Valle above Highway 501	10/23	F	CS				2.77	0.46	1.38		0.71	0.78	2.82	0.233	0.044	0.064	0.010	0.013	0.074	0.182	0.038	0.051	0.40
Cañon del Valle above Highway 501	10/23	UF	CS	0	57	192	10.00	0.80	0.60		11.70	2.31	3.44	10.400	0.930	0.144	0.441	0.101	0.144	11.900	1.040	0.182	2.99
Water Canyon above Highway 4	06/28	UF	CS																				
Water Canyon above Highway 4	06/28	UF	TOTC				30.90	2.25			26.55			9.940	0.565		0.454			10.791			
Water Canyon above Highway 4	10/27	F	CS																				3.06
Water Canyon above Highway 4	10/27	UF	CS	0	57	192																	12.40
Water Canyon above Highway 4	10/27	UF	DUP																				12.90
Indio Canyon at Highway 4	06/28	F	CS				5.01	0.49	0.36		-2.10	3.05	5.00	1.510	0.150	0.057	0.178	0.042	0.048	1.480	0.150	0.025	
Indio Canyon at Highway 4	06/28	F	DUP								-0.80	2.80	4.70										
Indio Canyon at Highway 4	06/28	UF	CS	40	60	190																	3.87
Water Canyon below Highway 4	06/28	F	CS				5.40	0.55	0.38		0.10	2.70	4.60	1.500	0.150	0.073	0.124	0.036	0.078	1.290	0.135	0.062	4.13
Water Canyon below Highway 4	06/28	F	DUP								-0.10	1.35	2.20										
Water Canyon below Highway 4	06/28	UF	CS	100	60	190																	
Water Canyon below Highway 4	06/28	UF	TOTC				62.10	4.45			61.36			18.630	1.305		1.540			20.581			
Water Canyon below Highway 4	07/29	F	CS				2.26	0.57	0.80		-0.37	0.89	2.96	3.800	0.309	0.054	0.205	0.038	0.043	4.970	0.393	0.016	
Water Canyon below Highway 4	07/29	UF	CS	-84	52	184	13.30	1.03	0.31		4.71	1.62	2.58	45.900	3.830	0.154	2.740	0.310	0.155	63.100	5.220	0.122	115.00
Water Canyon below Highway 4	07/29	UF	DUP				13.00	1.27	0.58		2.03	1.11	2.14										146.00
Water Canyon below Highway 4	08/12	UF	CS								1.09	1.17	4.22										7.82
Water Canyon below Highway 4	08/18	F	CS				1.05	0.33	0.51			0.84	2.83	0.139	0.041	0.126	-0.005	0.019	0.127	0.126	0.037	0.101	0.55
Water Canyon below Highway 4	08/18	F	DUP											0.199	0.042	0.085	-0.004	0.010	0.077	0.192	0.040	0.066	
Water Canyon below Highway 4	08/18	UF	CS	223	0	374	1.01	0.19	0.24			1.49	5.15	0.359	0.068	0.165	0.009	0.018	0.106	0.337	0.067	0.182	1.42
Water Canyon below Highway 4	10/23	F	CS																				0.92
Water Canyon below Highway 4	10/23	UF	CS																				4.37
Water Canyon below Highway 4	10/23	UF	DUP																				4.47
Water Canyon below Highway 4	10/27	F	CS				0.61	0.18	0.52		0.71	0.95	3.06	0.359	0.057	0.086	0.010	0.017	0.099	0.428	0.062	0.061	1.35
Water Canyon below Highway 4	10/27	UF	CS	-30	58	197	8.59	0.52	0.54		8.62	2.77	3.11	43.100	3.940	0.137	1.890	0.351	0.372	53.600	4.830	0.137	29.60
Potrillo Canyon near White Rock	08/09	UF	CS	-138	50	182	1.91	0.37	0.54		-0.33	0.86	2.92	9.380	0.877	0.366	0.344	0.093	0.155	10.300	0.947	0.253	5.83
Potrillo Canyon near White Rock	10/23	F	CS																				0.07
Potrillo Canyon near White Rock	10/23	F	DUP																				
Potrillo Canyon near White Rock	10/23	UF	CS	30	57	189																	2.37

Table 5-11. Radiochemical Analysis of Runoff Samples for 2000 (pCi/L[a]) (Cont.)

Station Name	Date	Codes[b]		^{3}H			^{90}Sr			^{137}Cs			^{234}U			$^{235,236}U$			^{238}U			U (µg/L)
Runoff Stations (Cont.)																						
Ancho Canyon:																						
Ancho Canyon at TA-39	08/18	UF	CS																			18.50
Ancho Canyon at TA-39	10/28	UF	CS																			3.57
Ancho Canyon near Bandelier NP	08/18	UF	CS																			14.40
Ancho Canyon near Bandelier NP	08/18	UF	DUP																			15.40
Ancho Canyon near Bandelier NP	10/23	UF	CS																			3.17
Ancho Canyon near Bandelier NP	10/28	UF	CS																			3.06
Runoff Grab Samples																						
Upper Los Alamos Reservoir	08/31	F	CS				0.87	0.29	0.33	1.16	1.15	4.18	0.290	0.049	0.070	0.006	0.013	0.079	0.143	0.033	0.061	0.40
Upper Los Alamos Reservoir	08/31	F	DUP										0.195	0.041	0.081	0.007	0.011	0.063	0.141	0.034	0.063	
Upper Los Alamos Reservoir	08/31	UF	CS				0.92	0.30	0.44	-0.80	1.01	3.44	0.214	0.044	0.110	-0.010	0.013	0.099	0.178	0.038	0.061	0.37
Upper Los Alamos Reservoir	08/31	UF	DUP	-57	54	186																
Los Alamos Reservoir	08/31	F	CS				3.20	0.43	0.38	0.00	1.12	4.23	0.453	0.070	0.122	0.031	0.018	0.072	0.234	0.046	0.057	0.88
Los Alamos Reservoir	08/31	UF	CS				3.63	0.41	0.37	0.79	1.02	3.57	0.452	0.076	0.157	0.082	0.032	0.109	0.339	0.062	0.097	1.10
Los Alamos Reservoir	08/31	UF	DUP							0.27	0.97	3.43										1.11
Los Alamos Canyon at SR-4 Weir	07/21	F	CS				26.60	4.42	2.69	1.14	0.67	2.51	2.060	0.172	0.037	0.088	0.020	0.011	1.920	0.162	0.037	6.01
Los Alamos Canyon at SR-4 Weir	07/21	F	DUP																			
Los Alamos Canyon at SR-4 Weir	07/21	UF	CS	0	40	136	1.95	1.21	1.96	0.00	1.54	2.38	2.950	0.295	0.101	0.131	0.041	0.101	2.430	0.253	0.080	8.23
Los Alamos Canyon at SR-4 Weir	07/21	UF	DUP	-60	39	136				1.58	0.80	2.96	2.890	0.278	0.069	0.132	0.038	0.087	2.440	0.243	0.025	8.25
Rendija Canyon at 3rd Crossing	07/17	F	CS																			2.74
Rendija Canyon at 3rd Crossing	07/17	F	CS				4.50	0.45	0.38	0.00	2.50	4.00	0.730	0.085	0.080	0.037	0.023	0.080	0.920	0.100	0.047	
Rendija Canyon at 3rd Crossing	07/17	UF	CS	100	55	180	72.00	6.50	0.39													
Rendija Canyon at 3rd Crossing	07/17	UF	DUP	60	55	180	73.00	6.50	0.42													
Rendija Canyon at 3rd Crossing	07/17	UF	TOTC							267.00	18.50		87.000	6.000		10.000	1.000		94.000	7.000		
Rendija Canyon at 3rd Crossing	07/17	UF	TOTCD				73.00															
Guaje Canyon at SR-502	07/09	F	CS							-0.40	1.45	2.40	1.490	0.110	0.022	0.101	0.017	0.022	1.960	0.140	0.007	5.89
Guaje Canyon at SR-502	07/09	UF	CS	-50	55	190																92.70
Guaje Canyon at SR-502	07/09	UF	TOTC							359.29			103.070			8.456			118.436			
Guaje Canyon at SR-502	09/08	F	CS				2.92	0.18	0.27	2.44	2.00	7.33	0.937	0.100	0.079	0.023	0.017	0.067	1.040	0.106	0.041	2.48
Guaje Canyon at SR-502	09/08	UF	CS	-120	56	198	80.80	9.49	9.19	221.78	14.63	8.50	136.000	24.800	2.070	3.800	1.140	0.606	134.000	24.300	0.604	10.00
Starmer's Gulch above Highway 501	10/23	F	CS				1.47	0.42	1.23	0.04	0.45	1.57	0.205	0.040	0.058	0.009	0.012	0.067	0.205	0.039	0.017	0.76
Starmer's Gulch above Highway 501	10/23	F	DUP										0.167	0.038	0.094	-0.014	0.007	0.081	0.214	0.042	0.062	
Starmer's Gulch above Highway 501	10/23	UF	CS	-61	56	194	12.10	0.77	0.83	17.10	2.32	3.48	18.700	1.560	0.148	0.695	0.131	0.148	19.800	1.650	0.148	2.67
Two-Mile Canyon at Highway 501	10/23	F	CS				2.70	0.66	1.80	-0.78	0.79	2.70	0.067	0.042	0.134	0.067	0.031	0.089	0.133	0.033	0.020	0.42
Two-Mile Canyon at Highway 501	10/23	F	DUP										0.095	0.040	0.116	0.022	0.016	0.054	0.029	0.025	0.088	
Two-Mile Canyon at Highway 501	10/23	UF	CS	-30	56	189	15.10	0.72	0.70	511.00	10.80	4.35	10.300	0.892	0.233	0.446	0.098	0.166	11.600	0.989	0.282	4.23
Pajarito Canyon at TA-18 Culvert	06/28	F	CS				5.40	0.50	0.34	0.10	2.25	3.80	2.280	0.175	0.051	0.182	0.030	0.028	2.370	0.180	0.028	6.34
Pajarito Canyon at TA-18 Culvert	06/28	UF	CS	40	60	190																
Pajarito Canyon at TA-18 Culvert	06/28	UF	TOTC				75.40	5.40		95.73			24.480	1.425		1.186			26.184			
Pajarito Canyon at G-1	06/28	F	CS				5.60	0.55	0.34	1.40	2.80	4.60	2.360	0.185	0.035	0.165	0.032	0.015	2.210	0.175	0.043	
Pajarito Canyon at G-1	06/28	UF	CS	-20	60	190																
Pajarito Canyon at G-1	06/28	UF	TOTC				51.20	4.35		13.47			12.640	0.630		0.676			13.265			
Pajarito Canyon at SR-4 Culvert	06/28	F	CS				6.30	0.60	0.37	0.80	2.60	4.30	2.520	0.190	0.028	0.288	0.041	0.040	2.480	0.185	0.035	8.37
Pajarito Canyon at SR-4 Culvert	06/28	F	DUP																			
Pajarito Canyon at SR-4 Culvert	06/28	UF	CS	0	60	190																
Pajarito Canyon at SR-4 Culvert	06/28	UF	TOTC				36.80	2.65		38.09			11.020	0.695		0.631			11.318			

Table 5-11. Radiochemical Analysis of Runoff Samples for 2000 (pCi/L[a]) (Cont.)

Station Name	Date	Codes[b]	^{3}H	^{90}Sr	^{137}Cs	^{234}U	$^{235,236}U$	^{238}U	U (µg/L)
Water Quality Standards[d]									
DOE DCG for Public Dose			2,000,000	1,000	3,000	500	600	600	800
DOE Drinking Water System DCG			80,000	40	120	20	24	24	30
EPA Primary Drinking Water Standard			20,000	8					30
EPA Screening Level									
NMWQCC Groundwater Limit									5,000
Historical Maximum for UF data			1,120	25	42.3				170
Historical Maximum for F data				15.9	29.4				3.01

Table 5-11. Radiochemical Analysis of Runoff Samples for 2000 (pCi/L[a]) (Cont.)

Station Name	Date	Codes[b]		^{238}Pu			^{239,240}Pu			^{241}Am			Gross Alpha			Gross Beta			Gross Gamma		
Runoff Stations																					
Los Alamos Canyon (includes Pueblo, DP Canyons):																					
Los Alamos Canyon at Los Alamos	06/03	F	CS	0.003	0.003	0.024	0.011	0.004	0.024				1.7	0.33	1.9	18.30	0.85	3.0			
Los Alamos Canyon at Los Alamos	06/03	UF	CS	-0.006	0.003	0.044	0.194	0.016	0.012				13.8	0.68	1.9	44.80	1.63	2.5			
Los Alamos Canyon at Los Alamos	07/18	F	CS																		
Los Alamos Canyon at Los Alamos	07/18	UF	CS																		
Los Alamos Canyon at Los Alamos	07/18	UF	DUP																		
Los Alamos Canyon at Los Alamos	07/18	F	CS	0.009	0.010	0.038	0.004	0.008	0.038	0.008	0.007	0.026	3.0	0.50	2.0	26.00	2.00	2.0			
Los Alamos Canyon at Los Alamos	07/18	F	DUP	-0.003	0.004		0.022	0.008		0.012	0.010										
Los Alamos Canyon at Los Alamos	07/18	UF	CS																		
Los Alamos Canyon at Los Alamos	07/18	UF	TOTC	0.001			1.000			1.000			118.0	8.50		192.00	10.50		383.00	18.5	
Los Alamos Canyon at Los Alamos	07/18	UF	CS																		
Los Alamos Canyon at Los Alamos	07/18	UF	TOTC	0.300			5.000	0.500		1.000			324.0	27.50		447.00	29.00		746.00	43.5	
Los Alamos Canyon at Los Alamos	09/12	F	CS	0.017	0.010	0.015	0.006	0.006	0.015				3.3	0.49	0.7	21.50	1.60	1.5			
Los Alamos Canyon at Los Alamos	09/12	F	DUP																		
Los Alamos Canyon at Los Alamos	09/12	UF	CS	0.032	0.019	0.029	0.116	0.039	0.029				21.8	27.10	16.0	52.40	64.50	32.5			
Los Alamos Canyon at Los Alamos	09/12	UF	DUP																		
Los Alamos Canyon below TA 2	06/02	UF	CS	0.080	0.011	0.046	13.500	0.475	0.014				268.0	10.75	21.0	310.00	11.75	27.0			
Los Alamos Canyon below TA 2	10/23	UF	CS																		
DP Canyon below Meadow at TA-21	07/25	F	CS																		
DP Canyon below Meadow at TA-21	07/25	UF	CS																		
DP Canyon below Meadow at TA-21	10/23	UF	CS																		
DP Canyon below Meadow at TA-21	10/27	F	CS																		
DP Canyon below Meadow at TA-21	10/27	F	DUP																		
DP Canyon below Meadow at TA-21	10/27	UF	CS																		
DP Canyon at Mouth	06/02	UF	CS	0.640	0.035	0.039	3.300	0.125	0.026				328.0	13.25	24.0	403.00	15.00	32.0			
DP Canyon at Mouth	10/12	UF	CS	0.878	0.133	0.008	3.720	0.530	0.008	20.700	1.420	0.069	14.4	2.11	1.4	67.40	4.82	2.3			
DP Canyon at Mouth	10/23	UF	CS																		
DP Canyon at Mouth	10/27	F	CS	0.004	0.007	0.030	0.012	0.009	0.030	0.044	0.014	0.031	0.6	0.40	1.3	16.30	1.31	2.2			
DP Canyon at Mouth	10/27	F	DUP	0.004	0.004	0.011	0.016	0.008	0.011	0.069	0.015	0.008	0.5	0.45	1.6	17.50	1.52	2.7			
DP Canyon at Mouth	10/27	UF	CS																		
Los Alamos Canyon near Los Alamos	06/02	UF	CS	0.780	0.043	0.040	10.900	0.400	0.016				570.0	23.75	50.0	930.00	35.00	70.0			
Los Alamos Canyon near Los Alamos	06/03	F	CS	0.018	0.005	0.012	0.015	0.005	0.031				1.9	0.33	1.9	19.10	0.85	2.5			
Los Alamos Canyon near Los Alamos	06/03	UF	CS	0.074	0.010	0.025	1.260	0.055	0.025				109.0	4.50	9.7	177.00	6.50	11.0			
Los Alamos Canyon near Los Alamos	06/03	UF	DUP										81.0	3.25	7.6	157.00	5.75	12.0			
Los Alamos Canyon near Los Alamos	07/09	UF	CS																		
Los Alamos Canyon near Los Alamos	07/09	UF	DUP																		
Los Alamos Canyon near Los Alamos	07/09	UF	TOTC	0.346			24.773			3.257											
Los Alamos Canyon near Los Alamos	07/09	F	CS	0.016	0.009	0.028	0.055	0.015	0.031	0.027	0.012	0.014									
Los Alamos Canyon near Los Alamos	07/09	F	DUP	0.007	0.007	0.026	0.070	0.016	0.023	0.025	0.013	0.017									
Los Alamos Canyon near Los Alamos	10/17	UF	CS	0.814	0.167	0.048	7.370	1.120	0.048	1.680	0.129	0.012	10.3	1.52	1.6	31.20	2.81	3.3			
Los Alamos Canyon near Los Alamos	10/23	F	CS	0.004	0.007	0.028	0.027	0.013	0.036	0.043	0.013	0.024	0.6	0.35	1.1	9.46	0.96	1.9			
Los Alamos Canyon near Los Alamos	10/23	F	DUP							0.051	0.017	0.041									
Los Alamos Canyon near Los Alamos	10/23	UF	CS	0.293	0.039	0.012	2.920	0.195	0.074	3.320	0.219	0.009	139.0	43.50	4.4	207.00	63.00	6.6			
Los Alamos Canyon near Los Alamos	10/27	F	CS																		
Los Alamos Canyon near Los Alamos	10/27	UF	CS	0.362	0.045	0.039	3.610	0.231	0.031	3.440	0.228	0.027	25.7	4.74	2.0	39.80	2.31	2.6			
Los Alamos Canyon near Los Alamos	10/27	UF	DUP																		
Pueblo Canyon near Los Alamos	10/23	F	CS																		
Pueblo Canyon near Los Alamos	10/23	UF	CS	0.210	0.052	0.081	22.800	1.410	0.081	0.748	0.087	0.055									
Pueblo Canyon near Los Alamos	10/23	UF	DUP	0.132	0.035	0.068	20.700	1.200	0.068												
Pueblo Canyon near Los Alamos	10/27	F	CS	0.111	0.030	0.016	0.169	0.041	0.043	0.024	0.009	0.009	1.2	0.45	1.0	10.20	1.08	2.4			
Pueblo Canyon near Los Alamos	10/27	UF	CS	0.163	0.027	0.027	15.100	0.836	0.010	0.749	0.068	0.027	22.4	4.26	1.8	24.90	1.63	2.4			

Table 5-11. Radiochemical Analysis of Runoff Samples for 2000 (pCi/L[a]) (Cont.)

Station Name	Date	Codes[b]		^{238}Pu			^{239,240}Pu			^{241}Am			Gross Alpha			Gross Beta			Gross Gamma
Runoff Stations (Cont.)																			
Sandia Canyon:																			
Sandia Canyon at TA-3	07/17	UF	CS																
Sandia Canyon at TA-3	07/17	UF	CS	0.013	0.006	0.016	0.012	0.007	0.019	0.012	0.010	0.041	3.0	0.50	2.0	17.00	1.50	2.0	
Sandia Canyon at TA-3	07/17	UF	DUP										3.0	0.50	2.0	17.00	1.50	2.0	
Sandia Canyon at TA-3	10/17	UF	CS	0.000	1.010	0.012	0.027	0.011	0.012	0.009	0.006	0.012	1.2	0.51	1.4	4.21	0.98	2.9	
Sandia Canyon at TA-3	10/17	UF	DUP										0.1	0.31	1.1	5.06	0.75	1.9	
Mortandad Canyon (includes Ten Site Canyon, Cañada del Buey):																			
TA-55	07/17	UF	CS																
TA-55	07/17	UF	CS	0.019	0.085	0.022	0.024	0.085	0.018	0.084	0.025	0.057	2.0	0.50	2.0	14.00	1.00	2.0	
TA-55	10/07	F	CS										0.6	0.30	0.9	3.93	0.60	1.6	
TA-55	10/07	F	DUP	0.007	0.011	0.041	0.017	0.012	0.037	0.047	0.016	0.039							
TA-55	10/07	UF	CS				0.004	0.008	0.034				1.1	0.41	0.9	9.85	1.59	1.8	
TA-55	10/07	UF	DUP				0.025	0.011	0.026				0.6	0.42	1.4	7.35	0.89	2.0	
Cañada del Buey near TA-46	10/23	UF	CS																
TA-54 MDA J	08/09	UF	CS																
TA-54 MDA J	08/09	UF	DUP																
TA-54 MDA J	07/15	UF	CS																
TA-54 MDA J	07/17	F	CS																
TA-54 MDA J	07/17	UF	CS																
TA-54 MDA J	07/17	UF	CS	0.003	0.006	0.028	0.007	0.005	0.010	0.012	0.010	0.040	1.0	0.50	2.0	8.00	1.00	2.0	
TA-54 MDA J	10/07	UF	CS										1.0	0.36	1.0	10.80	1.10	2.1	
TA-54 MDA G-6	07/29	F	CS	0.008	0.006	0.021	0.008	0.009	0.030	0.102	0.022	0.012	1.2	0.50	1.3	5.19	0.79	1.9	
TA-54 MDA G-6	07/29	F	DUP																
TA-54 MDA G-6	07/29	UF	CS	0.150	0.032	0.032	0.422	0.070	0.025	3.980	0.290	0.046	236.0	153.00	11.9	271.00	165.00	21.9	
TA-54 MDA G-6	07/29	UF	DUP										239.0	182.00	11.1	284.00	181.00	21.0	
TA-54 MDA G-6	08/18	F	CS	0.036	0.015	0.014	0.005	0.005	0.014	0.028	0.010	0.010	0.6	0.21	0.5	5.42	0.56	1.3	
TA-54 MDA G-6	08/18	UF	CS	0.173	0.034	0.028	0.188	0.036	0.022	0.082	0.021	0.047	14.4	3.71	1.2	23.50	1.68	1.7	
TA-54 MDA G-6	08/18	UF	DUP																
TA-54 MDA G-6	10/11	F	CS	0.009	0.008	0.028	0.024	0.009	0.008	0.023	0.012	0.035	1.1	0.32	0.8	2.57	0.44	1.3	
TA-54 MDA G-6	10/11	F	DUP																
TA-54 MDA G-6	10/11	UF	CS	0.208	0.072	0.149	0.400	0.105	0.172	0.150	0.037	0.058	172.0	55.30	3.8	196.00	47.90	5.9	
TA-54 MDA G-6	10/11	UF	DUP																
Cañada del Buey at White Rock	07/29	UF	CS																
Cañada del Buey at White Rock	07/29	F	CS																
Cañada del Buey at White Rock	08/09	UF	CS	2.860	0.419	0.049	0.325	0.061	0.049	0.200	0.064	0.054	71.3	20.00	3.6	90.70	13.20	4.7	
Cañada del Buey at White Rock	08/18	F	CS	0.004	0.004	0.012	0.009	0.006	0.012	0.012	0.009	0.028	-0.1	0.28	1.0	2.83	0.53	1.6	
Cañada del Buey at White Rock	08/18	F	DUP																
Cañada del Buey at White Rock	08/18	UF	CS	0.142	0.035	0.045	0.152	0.035	0.036	0.060	0.030	0.041	78.9	49.10	8.2	91.30	56.00	18.9	
Cañada del Buey at White Rock	08/18	UF	DUP																
Cañada del Buey at White Rock	10/11	UF	CS																
Cañada del Buey at White Rock	10/23	UF	CS	0.116	0.039	0.035	0.308	0.066	0.035	0.137	0.040	0.072	194.0	90.60	7.7	248.00	101.00	9.8	
Cañada del Buey at White Rock	10/28	F	CS																
Cañada del Buey at White Rock	10/28	UF	CS																

Table 5-11. Radiochemical Analysis of Runoff Samples for 2000 (pCi/L[a]) (Cont.)

Station Name	Date	Codes[b]		^{238}Pu			^{239,240}Pu			^{241}Am			Gross Alpha			Gross Beta			Gross Gamma
Runoff Stations (Cont.)																			
Pajarito Canyon (includes Two-Mile, Three-Mile Canyons):																			
Pajarito Canyon above Highway 501	06/28	F	CS	0.005	0.005	0.020	0.009	0.007	0.025	0.044	0.014	0.035	3.6	0.75	1.9	28.80	2.30	2.6	
Pajarito Canyon above Highway 501	06/28	UF	CS																
Pajarito Canyon above Highway 501	06/28	UF	TOTC	0.224	0.106		4.400	0.525		1.610	0.375		221.0	27.50		670.00	47.00		
Pajarito Canyon above Highway 501	09/08	F	CS	0.029	0.011	0.010	0.014	0.008	0.010				0.7	0.27	0.8	11.80	0.99	1.6	
Pajarito Canyon above Highway 501	09/08	F	DUP	0.006	0.010	0.042	0.035	0.015	0.016										
Pajarito Canyon above Highway 501	09/08	UF	CS	0.079	0.024	0.041	1.050	0.163	0.032				33.2	40.80	10.5	75.70	92.50	30.0	
Pajarito Canyon above Highway 501	09/08	UF	DUP										35.1	43.70	10.3	91.80	113.00	27.8	
Pajarito Canyon above Highway 501	10/23	F	CS	0.004	0.004	0.011	0.013	0.007	0.011	0.030	0.011	0.024	0.5	0.41	1.4	10.10	1.15	2.3	
Pajarito Canyon above Highway 501	10/23	F	DUP	0.004	0.004	0.012	0.000	1.000	0.033										
Pajarito Canyon above Highway 501	10/23	UF	CS	0.009	0.016	0.068	0.174	0.043	0.067	0.056	0.016	0.012	13.4	2.99	1.6	32.70	2.86	2.7	
Pajarito Canyon above Highway 501	10/23	UF	DUP																
Pajarito Canyon at TA-22	06/28	F	CS	0.009	0.005	0.008	0.017	0.007	0.008	0.032	0.011	0.022	3.4	0.80	2.3	24.40	2.00	2.7	
Pajarito Canyon at TA-22	06/28	UF	CS																
Pajarito Canyon at TA-22	06/28	UF	DUP																
Pajarito Canyon at TA-22	06/28	UF	TOTC	0.053	0.018		0.694	0.067		0.313	0.041		56.5	4.80		104.70	5.65		
Starmers Gulch at TA-22	06/28	F	CS	0.009	0.009	0.034	0.028	0.010	0.025	0.029	0.010	0.010	3.0	0.70	1.9	29.60	2.35	2.6	
Starmers Gulch at TA-22	06/28	UF	CS																
Starmers Gulch at TA-22	06/28	UF	TOTC	0.032	0.017		0.932	0.087		0.423	0.051		95.7	8.30		228.90	12.55		
TA-54 MDA G-1	10/11	F	CS																
TA-54 MDA G-1	10/11	UF	CS	0.160	0.037	0.036	0.063	0.020	0.013	0.030	0.012	0.012	35.5	5.13	1.5	59.80	3.80	1.4	
TA-54 MDA G-2	07/29	F	CS	-0.010	0.007	0.039	0.003	0.003	0.009	0.027	0.011	0.012	0.8	0.38	1.2	6.13	0.74	1.9	
TA-54 MDA G-2	07/29	F	DUP	0.003	0.003	0.008	0.017	0.007	0.008	0.058	0.016	0.029							
TA-54 MDA G-2	07/29	UF	CS	0.524	0.085	0.025	1.360	0.202	0.009	0.695	0.068	0.012	36.3	13.20	2.1	48.00	3.41	3.0	
TA-54 MDA G-2	08/09	F	CS	0.005	0.006	0.015	0.011	0.008	0.015	0.052	0.016	0.013	0.3	0.36	1.2	4.80	0.88	2.5	
TA-54 MDA G-2	08/09	F	DUP	0.006	0.006	0.017	-0.004	0.004	0.045	0.033	0.012	0.011							
TA-54 MDA G-2	08/09	UF	CS	0.211	0.044	0.034	0.232	0.047	0.050	0.204	0.063	0.050	123.0	71.90	3.1	151.00	34.90	4.3	
TA-54 MDA G-2	08/09	UF	DUP										131.0	57.30	2.5	141.00	26.80	4.3	
TA-54 MDA G-2	10/11	F	CS	0.025	0.010	0.023	0.028	0.010	0.008	0.020	0.012	0.037	0.7	0.27	0.8	3.29	0.48	1.4	
TA-54 MDA G-2	10/11	UF	CS	0.020	0.012	0.036	0.026	0.011	0.024	0.087	0.020	0.011	34.8	3.56	1.4	41.70	2.70	1.3	
TA-54 MDA G-3	07/29	UF	CS																
TA-54 MDA G-3	08/09	UF	CS	7.610	1.110	0.051	1.670	0.260	0.019	0.250	0.083	0.167	166.0	53.40	3.8	157.00	20.90	4.7	
TA-54 MDA G-3	08/18	F	CS	0.034	0.017	0.041	0.017	0.015	0.052	0.006	0.004	0.008	0.7	0.26	0.6	5.13	0.57	1.3	
TA-54 MDA G-3	08/18	F	DUP	0.016	0.008	0.011	0.004	0.004	0.011	0.010	0.014	0.050							
TA-54 MDA G-3	08/18	UF	CS	0.179	0.043	0.081	0.326	0.061	0.048	0.324	0.088	0.149	194.0	69.30	194.0	176.00	54.30	176.0	
TA-54 MDA G-3	08/18	UF	DUP										192.0	78.00	6.0	166.00	50.70	10.1	
TA-54 MDA G-3	10/11	F	CS																
TA-54 MDA G-3	10/11	UF	CS	0.022	0.011	0.027	0.241	0.045	0.027	0.242	0.035	0.030	41.5	13.50	0.9	48.50	3.78	1.5	
TA-54 MDA G-3	10/25	F	CS																
TA-54 MDA G-3	10/25	UF	CS																
TA-54 MDA G-3	10/28	F	CS	0.000	1.000	0.024	-0.003	0.006	0.031	0.043	0.013	0.024	0.4	0.28	0.9	3.56	0.73	2.1	
TA-54 MDA G-3	10/28	F	DUP																
TA-54 MDA G-3	10/28	UF	CS	0.032	0.012	0.030	0.181	0.026	0.024	0.149	0.026	0.011	12.4	3.10	2.1	17.90	1.82	2.5	
TA-54 MDA G-5	10/23	F	CS																
TA-54 MDA G-5	10/23	UF	CS	0.023	0.011	0.013	0.080	0.020	0.013	0.035	0.012	0.023	35.9	10.50	1.9	45.90	4.55	2.8	
TA-54 MDA G-4	08/15	UF	CS										6.7	1.11	0.7	20.10	1.07	1.6	
TA-54 MDA G-4	08/15	UF	DUP										5.6	0.73	0.7	17.70	0.98	1.6	
TA-54 MDA G-4	10/12	F	CS	0.006	0.005	0.009	0.048	0.014	0.009	0.863	0.074	0.026	2.0	0.39	0.8	5.39	0.53	1.3	
TA-54 MDA G-4	10/12	F	DUP	0.022	0.012	0.032	0.052	0.017	0.012	0.851	0.076	0.011							
TA-54 MDA G-4	10/12	UF	CS	0.017	0.008	0.009	0.118	0.026	0.009	1.340	0.105	0.048	9.2	2.56	1.0	15.40	1.11	1.4	
TA-54 MDA G-4	10/12	UF	DUP																

Table 5-11. Radiochemical Analysis of Runoff Samples for 2000 (pCi/L[a]) (Cont.)

Station Name	Date	Codes[b]		^{238}Pu			^{239,240}Pu			^{241}Am			Gross Alpha			Gross Beta			Gross Gamma
Runoff Stations (Cont.)																			
Pajarito Canyon (includes Two-Mile, Three-Mile Canyons): (Cont.)																			
Pajarito Canyon above Highway 4	06/28	F	CS	-0.001	0.004	0.022	0.022	0.009	0.022	0.024	0.012	0.030	4.5	0.65	1.4	45.00	3.20	1.8	
Pajarito Canyon above Highway 4	06/28	F	DUP																
Pajarito Canyon above Highway 4	06/28	UF	CS										28.8	2.85	4.7	173.00	12.00	4.6	
Pajarito Canyon above Highway 4	06/28	UF	TOTC	0.042	0.017		1.163	0.094		0.466	0.058		71.5	5.15		239.20	13.10		
Pajarito Canyon above Highway 4	10/24	F	CS	0.000	1.010	0.009	0.017	0.008	0.009	0.000	1.000	0.034							
Pajarito Canyon above Highway 4	10/24	UF	CS	0.011	0.009	0.033	0.169	0.027	0.033	0.072	0.018	0.012							
Pajarito Canyon above Highway 4	10/24	UF	DUP																
Pajarito Canyon above Highway 4	10/27	F	CS	0.087	0.022	0.011	0.064	0.019	0.029	0.031	0.012	0.026	2.1	0.75	1.8	12.50	1.27	2.5	
Pajarito Canyon above Highway 4	10/27	UF	CS	0.014	0.011	0.037	0.096	0.021	0.037	0.052	0.017	0.032	14.4	4.72	1.2	17.60	2.71	2.3	
Water Canyon (includes Cañon del Valle, Potrillo, Fence, Indio Canyons):																			
Water Canyon above Highway 501	06/28	UF	CS																
Water Canyon above Highway 501	06/28	UF	TOTC	0.039	0.011		0.840	0.060		0.594	0.057		46.6	3.50		211.80	11.85		
Water Canyon above Highway 501	10/23	F	CS	0.000	0.006	0.030	0.008	0.008	0.030	0.015	0.008	0.023	2.4	0.81	1.4	14.50	1.55	2.3	
Water Canyon above Highway 501	10/23	UF	CS	0.113	0.051	0.061	1.150	0.180	0.166	0.425	0.088	0.044	337.0	432.00	14.9	580.00	710.00	30.6	
Water Canyon above Highway 501	10/23	UF	DUP							0.465	0.088	0.039							
Cañon del Valle above Highway 501	06/28	UF	CS																
Cañon del Valle above Highway 501	06/28	UF	TOTC	0.042	0.020		0.808	0.081		0.311	0.048		118.1	9.45		306.00	16.00		
Cañon del Valle above Highway 501	10/23	F	CS	-0.010	0.007	0.048	0.015	0.012	0.038	0.009	0.007	0.023	0.5	0.38	1.2	9.53	1.08	2.4	
Cañon del Valle above Highway 501	10/23	UF	CS	0.360	0.111	0.089	2.450	0.331	0.089	0.412	0.060	0.019	273.0	332.00	19.7	514.00	624.00	29.1	
Water Canyon above Highway 4	06/28	UF	CS																
Water Canyon above Highway 4	06/28	UF	TOTC	0.044	0.029		1.223	0.127		0.420	0.075		80.2	7.65		244.20	13.30		
Water Canyon above Highway 4	10/27	F	CS																
Water Canyon above Highway 4	10/27	UF	CS																
Water Canyon above Highway 4	10/27	UF	DUP																
Indio Canyon at Highway 4	06/28	F	CS	0.014	0.008	0.021	0.013	0.007	0.009	0.020	0.011	0.034	3.0	0.80	2.1	34.60	2.65	2.5	
Indio Canyon at Highway 4	06/28	F	DUP																
Indio Canyon at Highway 4	06/28	UF	CS																
Water Canyon below Highway 4	06/28	F	CS	0.006	0.008	0.034	0.025	0.009	0.009	0.022	0.014	0.041	3.1	0.80	2.2	40.90	3.10	3.0	
Water Canyon below Highway 4	06/28	F	DUP																
Water Canyon below Highway 4	06/28	UF	CS																
Water Canyon below Highway 4	06/28	UF	TOTC	0.243	0.079		3.220	0.340		0.818	0.158		214.0	21.50		483.00	28.50		
Water Canyon below Highway 4	07/29	F	CS	0.011	0.007	0.010	0.023	0.010	0.010	0.053	0.016	0.012	6.1	1.01	1.4	17.60	1.59	2.9	
Water Canyon below Highway 4	07/29	UF	CS	0.296	0.057	0.014	2.950	0.434	0.047	4.200	0.365	0.033	63.3	18.50	8.6	121.00	12.10	12.2	
Water Canyon below Highway 4	07/29	UF	DUP										69.6	21.10	8.7	148.00	14.30	10.1	
Water Canyon below Highway 4	08/12	UF	CS																
Water Canyon below Highway 4	08/18	F	CS	0.025	0.015	0.046	0.005	0.009	0.037	0.019	0.010	0.030	1.1	0.35	0.7	7.17	0.67	1.5	
Water Canyon below Highway 4	08/18	F	DUP										0.4	0.28	0.8	6.59	0.95	1.3	
Water Canyon below Highway 4	08/18	UF	CS	0.011	0.013	0.050	0.075	0.026	0.058	0.033	0.013	0.031	8.3	1.93	1.0	19.20	1.41	1.5	
Water Canyon below Highway 4	10/23	F	CS																
Water Canyon below Highway 4	10/23	UF	CS										212.0	99.30	9.4	303.00	123.00	10.5	
Water Canyon below Highway 4	10/23	UF	DUP																
Water Canyon below Highway 4	10/27	F	CS	0.069	0.020	0.012	0.017	0.009	0.012	0.032	0.011	0.024	0.6	0.41	1.3	8.07	1.00	2.4	
Water Canyon below Highway 4	10/27	UF	CS	0.064	0.015	0.009	0.465	0.047	0.025	0.211	0.037	0.053	457.0	558.00	18.9	675.00	821.00	39.1	
Potrillo Canyon near White Rock	08/09	UF	CS	0.017	0.010	0.030	0.139	0.031	0.030	0.160	0.057	0.054	40.7	7.38	2.1	55.80	7.23	4.0	
Potrillo Canyon near White Rock	10/23	F	CS										0.9	0.34	0.9	3.41	0.57	1.5	
Potrillo Canyon near White Rock	10/23	F	DUP										1.6	0.69	0.8	2.78	0.75	1.6	
Potrillo Canyon near White Rock	10/23	UF	CS										148.0	65.00	3.9	171.00	52.80	7.3	

Table 5-11. Radiochemical Analysis of Runoff Samples for 2000 (pCi/L[a]) (Cont.)

Station Name	Date	Codes[b]		^{238}Pu			^{239,240}Pu			^{241}Am			Gross Alpha			Gross Beta			Gross Gamma	
Runoff Stations (Cont.)																				
Ancho Canyon:																				
Ancho Canyon at TA-39	08/18	UF	CS																	
Ancho Canyon at TA-39	10/28	UF	CS																	
Ancho Canyon near Bandelier NP	08/18	UF	CS																	
Ancho Canyon near Bandelier NP	08/18	UF	DUP																	
Ancho Canyon near Bandelier NP	10/23	UF	CS																	
Ancho Canyon near Bandelier NP	10/28	UF	CS																	
Runoff Grab Samples																				
Upper Los Alamos Reservoir	08/31	F	CS	0.036	0.012	0.010	0.004	0.006	0.026	0.004	0.008	0.035								
Upper Los Alamos Reservoir	08/31	F	DUP																	
Upper Los Alamos Reservoir	08/31	UF	CS	0.004	0.004	0.011	0.008	0.009	0.031	0.022	0.009	0.010								
Upper Los Alamos Reservoir	08/31	UF	DUP																	
Los Alamos Reservoir	08/31	F	CS	0.038	0.015	0.031	0.013	0.008	0.011	0.026	0.009	0.009								
Los Alamos Reservoir	08/31	UF	CS	0.000	1.010	0.014	0.005	0.009	0.039	0.020	0.010	0.025								
Los Alamos Reservoir	08/31	UF	DUP																	
Los Alamos Canyon at SR-4 Weir	07/21	F	CS	0.125	0.027	0.009	0.028	0.011	0.009	0.084	0.019	0.028	5.7	1.11	1.2	33.50	2.37	2.3		
Los Alamos Canyon at SR-4 Weir	07/21	F	DUP										4.2	0.71	1.4	37.00	2.57	2.1		
Los Alamos Canyon at SR-4 Weir	07/21	UF	CS	0.042	0.016	0.031	0.386	0.068	0.031	0.180	0.029	0.034	27.1	9.47	5.0	69.10	21.50	11.6		
Los Alamos Canyon at SR-4 Weir	07/21	UF	DUP	0.062	0.017	0.009	0.455	0.075	0.025	0.179	0.027	0.009								
Rendija Canyon at 3rd Crossing	07/17	F	CS																	
Rendija Canyon at 3rd Crossing	07/17	F	CS	0.007	0.055	0.020	0.030	0.085	0.007	0.020	0.011	0.029	1.0	0.50	2.0	19.00	1.50	2.0		
Rendija Canyon at 3rd Crossing	07/17	UF	CS																	
Rendija Canyon at 3rd Crossing	07/17	UF	DUP																	
Rendija Canyon at 3rd Crossing	07/17	UF	TOTC	1.000	0.000		15.000	1.500		2.000	0.000		480.0	38.00		1,054.00	64.00		1,249.00	36.0
Rendija Canyon at 3rd Crossing	07/17	UF	TOTC																	
Guaje Canyon at SR-502	07/09	F	CS	0.003	0.005	0.024	0.022	0.008	0.008	0.038	0.017	0.044								
Guaje Canyon at SR-502	07/09	UF	CS																	
Guaje Canyon at SR-502	07/09	UF	TOTC	1.228			17.727			5.552										
Guaje Canyon at SR-502	09/08	F	CS	0.004	0.009	0.036	0.015	0.010	0.028				3.3	0.60	0.6	14.90	1.18	1.5		
Guaje Canyon at SR-502	09/08	UF	CS	0.354	0.127	0.237	7.630	1.220	0.237				367.0	2,230.00	81.2	685.00	4,160.00	153.0		
Starmer's Gulch above Highway 501	10/23	F	CS	0.008	0.010	0.039	0.025	0.012	0.031	0.020	0.012	0.037	2.9	0.66	0.6	20.10	1.19	1.4		
Starmer's Gulch above Highway 501	10/23	F	DUP																	
Starmer's Gulch above Highway 501	10/23	UF	CS	0.219	0.079	0.074	3.070	0.338	0.074	0.373	0.058	0.021	161.0	72.10	7.1	268.00	109.00	10.2		
Two-Mile Canyon at Highway 501	10/23	F	CS	0.015	0.009	0.014	0.025	0.013	0.037	0.028	0.015	0.041	3.3	0.82	1.3	21.20	1.45	2.0		
Two-Mile Canyon at Highway 501	10/23	F	DUP																	
Two-Mile Canyon at Highway 501	10/23	UF	CS	0.078	0.032	0.035	1.090	0.135	0.035	0.473	0.070	0.023	246.0	315.00	14.5	443.00	542.00	28.7		
Pajarito Canyon at TA-18 Culvert	06/28	F	CS	0.005	0.005	0.020	0.013	0.007	0.009	0.040	0.015	0.030	5.7	0.70	1.3	38.60	2.75	1.8		
Pajarito Canyon at TA-18 Culvert	06/28	UF	CS																	
Pajarito Canyon at TA-18 Culvert	06/28	UF	TOTC	0.197	0.097		3.760	0.430		1.180	0.235		203.0	22.50		593.00	36.00			
Pajarito Canyon at G-1	06/28	F	CS	0.015	0.007	0.008	0.016	0.007	0.018	0.040	0.013	0.024	4.1	0.65	1.5	47.20	3.35	1.7		
Pajarito Canyon at G-1	06/28	UF	CS																	
Pajarito Canyon at G-1	06/28	UF	TOTC	0.075	0.024		0.837	0.091		0.259	0.053		48.2	4.85		254.20	14.35			
Pajarito Canyon at SR-4 Culvert	06/28	F	CS	-0.004	0.008	0.039	0.016	0.007	0.009	0.009	0.007	0.024	5.6	0.75	1.6	44.50	3.20	1.9		
Pajarito Canyon at SR-4 Culvert	06/28	F	DUP										7.0	0.90	1.9	47.30	3.35	1.9		
Pajarito Canyon at SR-4 Culvert	06/28	UF	CS																	
Pajarito Canyon at SR-4 Culvert	06/28	UF	TOTC	0.117	0.044		2.250	0.200		0.975	0.131		125.1	11.30		339.00	18.50			

Table 5-11. Radiochemical Analysis of Runoff Samples for 2000 (pCi/L[a]) (Cont.)

Station Name	Date	Codes[b]	^{238}Pu	^{239,240}Pu	^{241}Am	Gross Alpha	Gross Beta	Gross Gamma
Water Quality Standards[d]								
DOE DCG for Public Dose			40	30	30	30	1,000.00	
DOE Drinking Water System DCG			1.6	1.2	1.2	1.2	40.00	
EPA Primary Drinking Water Standard						15		
EPA Screening Level							50.00	
NMWQCC Groundwater Limit								
Historical Maximum for UF data			1.5308	15.778	15.168	640.8	1,637.00	622.50
Historical Maximum for F data			0.105	0.99	3.509	27.5	40.00	499.20

[a] Except where noted. Three columns are listed: the first is the analytical result, the second is the radioactive counting uncertainty (1 standard deviation), and the third is the analytic laboratory measurement-specific minimum detectable activity.

[b] Codes: UF–Unfiltered sample; F–Filttered Sample; CS–Customer Sample; DUP–Laboratory Duplicate; TOTC–Total Concentration Calculated from Laboratory Data; TOTC D–Total Concentration Calculated from Laboratory Duplicate.

[c] Less than symbol (<) means measurement was below the specified limit of detection of the anytical method.

[d] Standards given here for comparison only; see Appendix A.

Table 5-12. Comparison of Radionuclides in Unfiltered Runoff Samples for 2000 to Standards[a]

Station Name	Date	Codes[b]	Analyte	Result[c]	Uncertainty[d]	MDA[e]	Units	Lab Qual Code[f]	Value/ Minimum Standard	Minimum Standard	Minimum Standard Type	DOE DCG	Result/ DOE DCG
Runoff Stations													
Los Alamos Canyon (includes Pueblo, DP Canyons):													
Los Alamos Canyon at Los Alamos	06/03	UF CS	Gross Alpha	13.8	0.7	1.9	pCi/L		0.92	15	NM LVSTK WTR STD		
Los Alamos Canyon at Los Alamos	07/18	UF TOTC	Gross Alpha	118.0	8.5		pCi/L		7.87	15	NM LVSTK WTR STD	30	3.93
Los Alamos Canyon at Los Alamos	07/18	UF TOTC	Gross Alpha	324.0	27.5		pCi/L		21.60	15	NM LVSTK WTR STD	30	10.80
Los Alamos Canyon below TA-2	06/02	UF CS	Gross Alpha	268.0	10.8	21.0	pCi/L		17.87	15	NM LVSTK WTR STD	30	8.93
DP Canyon at Mouth	10/12	UF CS	^{241}Am	20.700	1.420	0.069	pCi/L		0.69	30	DOE DCG		
DP Canyon at Mouth	10/12	UF CS	Gross Alpha	14.4	2.1	1.4	pCi/L		0.96	15	NM LVSTK WTR STD		
DP Canyon at Mouth	06/02	UF CS	Gross Alpha	328.0	13.3	24.0	pCi/L		21.87	15	NM LVSTK WTR STD	30	10.93
Los Alamos Canyon near Los Alamos	10/17	UF CS	Gross Alpha	10.3	1.5	1.6	pCi/L		0.69	15	NM LVSTK WTR STD		
Los Alamos Canyon near Los Alamos	10/23	UF CS	Gross Alpha	139.0	43.5	4.4	pCi/L		9.27	15	NM LVSTK WTR STD	30	4.63
Los Alamos Canyon near Los Alamos	10/27	UF CS	Gross Alpha	25.7	4.7	2.0	pCi/L		1.71	15	NM LVSTK WTR STD		
Los Alamos Canyon near Los Alamos	06/02	UF CS	Gross Alpha	570.0	23.8	50.0	pCi/L		38.00	15	NM LVSTK WTR STD	30	19.00
Los Alamos Canyon near Los Alamos	06/02	UF CS	Gross Beta	930.0	35.0	70.0	pCi/L		0.93	1,000	DOE DCG		
Los Alamos Canyon near Los Alamos	06/03	UF CS	Gross Alpha	109.0	4.5	9.7	pCi/L		7.27	15	NM LVSTK WTR STD	30	3.63
Los Alamos Canyon near Los Alamos	06/03	UF DUP	Gross Alpha	81.0	3.3	7.6	pCi/L		5.40	15	NM LVSTK WTR STD	30	2.70
Los Alamos Canyon near Los Alamos	07/09	UF TOTC	^{239,240}Pu	24.773			pCi/L		0.83	30	DOE DCG		
Pueblo Canyon near Los Alamos	10/23	UF CS	^{239,240}Pu	22.800	1.410	0.081	pCi/L		0.76	30	DOE DCG		
Pueblo Canyon near Los Alamos	10/23	UF DUP	^{239,240}Pu	20.700	1.200	0.068	pCi/L		0.69	30	DOE DCG		
Pueblo Canyon near Los Alamos	10/27	UF CS	Gross Alpha	22.4	4.3	1.8	pCi/L		1.49	15	NM LVSTK WTR STD		
Pueblo Canyon near Los Alamos	10/27	UF CS	^{239,240}Pu	15.100	0.836	0.010	pCi/L		0.50	30	DOE DCG		
Mortandad Canyon (includes Ten Site Canyon, Cañada del Buey):													
TA-54 MDA G-6	08/18	UF CS	Gross Alpha	14.4	3.7	1.2	pCi/L		0.96	15	NM LVSTK WTR STD		
TA-54 MDA G-6	10/11	UF CS	Gross Alpha	172.0	55.3	3.8	pCi/L		11.47	15	NM LVSTK WTR STD	30	5.73
Cañada del Buey at White Rock	08/09	UF CS	Gross Alpha	71.3	20.0	3.6	pCi/L		4.75	15	NM LVSTK WTR STD	30	2.38
Pajarito Canyon (includes Two-Mile, Three-Mile Canyons):													
Pajarito Canyon above Highway 501	10/23	UF CS	Gross Alpha	13.4	3.0	1.6	pCi/L		0.89	15	NM LVSTK WTR STD		
Pajarito Canyon above Highway 501	06/28	UF CS	Gross Alpha	18.8	2.1	4.1	pCi/L		1.25	15	NM LVSTK WTR STD		
Pajarito Canyon above Highway 501	06/28	UF TOTC	Gross Alpha	221.0	27.5		pCi/L		14.73	15	NM LVSTK WTR STD	30	7.37
Pajarito Canyon above Highway 501	06/28	UF TOTC	Gross Beta	670.0	47.0		pCi/L		0.67	1,000	DOE DCG		
Pajarito Canyon at TA-22	06/28	UF CS	Gross Alpha	7.9	1.0	1.9	pCi/L		0.53	15	NM LVSTK WTR STD		
Pajarito Canyon at TA-22	06/28	UF DUP	Gross Alpha	7.8	1.0	1.9	pCi/L		0.52	15	NM LVSTK WTR STD		
Pajarito Canyon at TA-22	06/28	UF TOTC	Gross Alpha	56.5	4.8		pCi/L		3.77	15	NM LVSTK WTR STD	30	1.88
Starmers Gulch at TA-22	06/28	UF CS	Gross Alpha	11.7	1.3	2.3	pCi/L		0.78	15	NM LVSTK WTR STD		
Starmers Gulch at TA-22	06/28	UF TOTC	Gross Alpha	95.7	8.3		pCi/L		6.38	15	NM LVSTK WTR STD	30	3.19
TA-54 MDA G-1	10/11	UF CS	Gross Alpha	35.5	5.1	1.5	pCi/L		2.37	15	NM LVSTK WTR STD	30	1.18
TA-54 MDA G-2	10/11	UF CS	Gross Alpha	34.8	3.6	1.4	pCi/L		2.32	15	NM LVSTK WTR STD	30	1.16
TA-54 MDA G-3	08/09	UF CS	Gross Alpha	166.0	53.4	3.8	pCi/L		11.07	15	NM LVSTK WTR STD	30	5.53
TA-54 MDA G-3	10/11	UF CS	Gross Alpha	41.5	13.5	0.9	pCi/L		2.77	15	NM LVSTK WTR STD	30	1.38
TA-54 MDA G-3	10/28	UF CS	Gross Alpha	12.4	3.1	2.1	pCi/L		0.83	15	NM LVSTK WTR STD		
TA-54 MDA G-5	10/23	UF CS	Gross Alpha	35.9	10.5	1.9	pCi/L		2.39	15	NM LVSTK WTR STD	30	1.20

Table 5-12. Comparison of Radionuclides in Unfiltered Runoff Samples for 2000 to Standards[a] (Cont.)

Station Name	Date	Codes[b]	Analyte	Result[c]	Uncertainty[d]	MDA[e]	Units	Lab Qual Code[f]	Value/ Minimum Standard	Minimum Standard	Minimum Standard Type	DOE DCG	Result/ DOE DCG
Runoff Stations (Cont.)													
Pajarito Canyon (includes Two-Mile, Three-Mile Canyons): (Cont.)													
TA-54 MDA G-4	10/12	UF CS	Gross Alpha	9.2	2.6	1.0	pCi/L		0.62	15	NM LVSTK WTR STD		
Pajarito Canyon above Highway 4	10/27	UF CS	Gross Alpha	14.4	4.7	1.2	pCi/L		0.96	15	NM LVSTK WTR STD		
Pajarito Canyon above Highway 4	06/28	UF CS	Gross Alpha	28.8	2.9	4.7	pCi/L		1.92	15	NM LVSTK WTR STD		
Pajarito Canyon above Highway 4	06/28	UF TOTC	Gross Alpha	71.5	5.2		pCi/L		4.77	15	NM LVSTK WTR STD	30	2.38
Water Canyon (includes Cañon del Valle, Potrillo, Fence, Indio Canyons):													
Water Canyon above Highway 501	06/28	UF CS	Gross Alpha	18.4	2.3	4.9	pCi/L		1.23	15	NM LVSTK WTR STD		
Water Canyon above Highway 501	06/28	UF TOTC	Gross Alpha	46.6	3.5		pCi/L		3.11	15	NM LVSTK WTR STD	30	1.55
Canon del Valle above Highway 501	06/28	UF CS	Gross Alpha	25.0	2.9	5.7	pCi/L		1.67	15	NM LVSTK WTR STD		
Canon del Valle above Highway 501	06/28	UF TOTC	Gross Alpha	118.1	9.5		pCi/L		7.87	15	NM LVSTK WTR STD	30	3.94
Water Canyon at Highway 4	06/28	UF CS	Gross Alpha	13.2	1.6	3.2	pCi/L		0.88	15	NM LVSTK WTR STD		
Water Canyon at Highway 4	06/28	UF TOTC	Gross Alpha	80.2	7.7		pCi/L		5.35	15	NM LVSTK WTR STD	30	2.67
Water Canyon below Highway 4	07/29	UF CS	Gross Alpha	63.3	18.5	8.6	pCi/L		4.22	15	NM LVSTK WTR STD	30	2.11
Water Canyon below Highway 4	07/29	UF DUP	Gross Alpha	69.6	21.1	8.7	pCi/L		4.64	15	NM LVSTK WTR STD	30	2.32
Water Canyon below Highway 4	08/18	UF CS	Gross Alpha	8.3	1.9	1.0	pCi/L		0.55	15	NM LVSTK WTR STD		
Water Canyon below Highway 4	06/28	UF CS	Gross Alpha	12.6	2.5	6.8	pCi/L		0.84	15	NM LVSTK WTR STD		
Water Canyon below Highway 4	06/28	UF TOTC	Gross Alpha	214.0	21.5		pCi/L		14.27	15	NM LVSTK WTR STD	30	7.13
Potrillo Canyon near White Rock	08/09	UF CS	Gross Alpha	40.7	7.4	2.1	pCi/L		2.71	15	NM LVSTK WTR STD	30	1.36
Runoff Grab Samples													
Rendija Canyon at 3rd Crossing	07/17	UF TOTC	Gross Alpha	480.0	38.0		pCi/L		32.00	15	NM LVSTK WTR STD	30	16.00
Rendija Canyon at 3rd Crossing	07/17	UF TOTC	Gross Beta	1054.0	64.0		pCi/L		1.05	1,000	DOE DCG	1,000	1.05
Rendija Canyon at 3rd Crossing	07/17	UF TOTC	$^{239,240}Pu$	15.000	1.500		pCi/L		0.50	30	DOE DCG		
Guaje Canyon at SR-502	07/09	UF TOTC	$^{239,240}Pu$	17.727			pCi/L		0.59	30	DOE DCG		
Pajarito Canyon at TA-18 Culvert	06/28	UF TOTC	Gross Alpha	203.0	22.5		pCi/L		13.53	15	NM LVSTK WTR STD	30	6.77
Pajarito Canyon at TA-18 Culvert	06/28	UF TOTC	Gross Beta	593.0	36.0		pCi/L		0.59	1,000	DOE DCG		
Pajarito Canyon at G-1	06/28	UF CS	Gross Alpha	16.5	3.0	8.0	pCi/L		1.10	15	NM LVSTK WTR STD		
Pajarito Canyon at G-1	06/28	UF TOTC	Gross Alpha	48.2	4.9		pCi/L		3.21	15	NM LVSTK WTR STD	30	1.61
Pajarito Canyon at SR-4 Culvert	06/28	UF CS	Gross Alpha	16.9	2.0	4.1	pCi/L		1.13	15	NM LVSTK WTR STD		
Pajarito Canyon at SR-4 Culvert	06/28	UF TOTC	Gross Alpha	125.1	11.3		pCi/L		8.34	15	NM LVSTK WTR STD	30	4.17

[a] Values shown in the val/min std column are greater than 50% of the minimum standard used for comparison purposes. The minimum standard is either the DOE derived concentration guide (DCG) or the New Mexico Livestock Watering Standard, which contain applicable radionuclide standards for unfiltered storm water runoff.

[b] Codes: UF–Unfiltered Sample; F–Filtered Samples; CS–Customer Sample; DUP–Duplicate; TOTC–Value Calculated from Other Results; TOTCD–Duplicate Calculated Value.

[c] Values shown in the results column are >50% of the referenced standards. Not all data are shown.

[d] One standard deviation radioactivity counting uncertainty.

[e] Minimum detectable activities.

[f] Codes: B–analyte found in lab blank; U–analyte not detected.

Table 5-13. Comparison of Radionuclides in Filtered Runoff Water Samples for 2000 to Standards[a]

Station Name	Date	Codes[b]	Analyte	Result[c]	Uncertainty[d]	MDA[e]	Units	Lab Qual Code[f]	Value Minimum Standard	Minimum Standard	Minimum Standard Type	DOE DCG	Result/ DOE DCG
Runoff Stations													
Los Alamos Canyon (includes Pueblo, DP Canyons):													
Los Alamos Canyon at Los Alamos	07/18	F CS	^{90}Sr	4.24	0.43	0.39	pCi/L		0.53	8	EPA PRIM DW STD		
DP Canyon at Mouth	10/27	F CS	^{90}Sr	7.33	0.31	0.48	pCi/L		0.92	8	EPA PRIM DW STD		
Los Alamos Canyon near Los Alamos	10/23	F CS	^{90}Sr	4.60	0.47	1.23	pCi/L		0.58	8	EPA PRIM DW STD		
Pajarito Canyon (includes Two-Mile, Three-Mile Canyons):													
TA-54 MDA G-2	10/11	F CS	^{137}Cs	62.40	2.33	2.33	pCi/L		0.52	120	DOE DW DCG		
TA-54 MDA G-4	10/12	F CS	^{241}Am	0.863	0.074	0.026	pCi/L		0.72	1.2	DOE DW DCG		
TA-54 MDA G-4	10/12	F DUP	^{241}Am	0.851	0.076	0.011	pCi/L		0.71	1.2	DOE DW DCG		
Pajarito Canyon above Highway 4	06/28	F CS	^{90}Sr	6.10	0.60	0.35	pCi/L		0.76	8	EPA PRIM DW STD		
Pajarito Canyon above Highway 4	06/28	F DUP	^{90}Sr	6.00	0.55	0.32	pCi/L		0.75	8	EPA PRIM DW STD		
Water Canyon (includes Cañon del Valle, Potrillo, Fence, Indio Canyons):													
Water Canyon above Highway 501	10/23	F CS	^{90}Sr	5.07	0.55	1.35	pCi/L		0.63	8	EPA PRIM DW STD		
Indio Canyon at Highway 4	06/28	F CS	^{90}Sr	5.01	0.49	0.36	pCi/L		0.63	8	EPA PRIM DW STD		
Water Canyon below Highway 4	06/28	F CS	^{90}Sr	5.40	0.55	0.38	pCi/L		0.68	8	EPA PRIM DW STD		
Los Alamos Canyon at SR-4 Weir	07/21	F CS	^{90}Sr	26.60	4.42	2.69	pCi/L		3.33	8	EPA PRIM DW STD		
Rendija Canyon at 3rd Crossing	07/17	F CS	^{90}Sr	4.50	0.45	0.38	pCi/L		0.56	8	EPA PRIM DW STD		
Pajarito Canyon at TA-18 Culvert	06/28	F CS	^{90}Sr	5.40	0.50	0.34	pCi/L		0.68	8	EPA PRIM DW STD		
Pajarito Canyon at G-1	06/28	F CS	^{90}Sr	5.60	0.55	0.34	pCi/L		0.70	8	EPA PRIM DW STD		
Pajarito Canyon at SR-4 Culvert	06/28	F CS	^{90}Sr	6.30	0.60	0.37	pCi/L		0.79	8	EPA PRIM DW STD		

[a] Values shown in the val/min std column are greater than 50% of the minimum standard used for comparison purposes. The minimum standard is either the DOE derived concentration guide (DCG), the DOE drinking water DCG, the EPA primary DW standard, or the New Mexico Groundwater Limit, which contain applicable radionuclide standards for filtered storm water runoff.
[b] Codes: UF–Unfiltered Sample; F–Filtered Samples; CS–Customer Sample; DUP–Duplicate.
[c] Values shown in the results column are >50% of the referenced standards. Not all data are shown.
[d] One standard deviation radioactivity counting uncertainty.
[e] Minimum detectable activities.
[f] Codes: B–analyte found in lab blank; U–analyte not detected.

Table 5-14. Calculated Radionuclides Concentrations and Uncertainties for Suspended Sediments in Runoff Samples (pCi/g unless otherwise noted)[a]

Station Name	Date	TSS[b] (mg/L)	Analyte	Radionuclide Concentration	Uncertainty[c]	SAL[d]	Ratio Concentration/ SAL
Twomile above Hwy 501	10/23	9,010	^{137}Cs	56.7	5.8	4.4	12.9
Guaje Canyon at SR-502	07/09	37,000	^{137}Cs	9.7		4.4	2.2
Los Alamos near Los Alamos	06/03	2,300	^{137}Cs	9.4	1.3	4.4	2.1
Los Alamos near Los Alamos	07/09	14,900	^{137}Cs	7.2		4.4	1.6
Rendija Canyon 3rd Crossing	07/17	38,000	^{137}Cs	7.0	0.9	4.4	1.6
Pajarito above Hwy 4	06/28	2,400	^{137}Cs	6.6		4.4	1.5
Pajarito at Hwy 4 Culvert	06/28	5,700	^{137}Cs	6.5		4.4	1.5
Water below Hwy 4	06/28	9,400	^{137}Cs	6.5		4.4	1.5
Water below Hwy 4	06/28	9,400	^{137}Cs	6.5		4.4	1.5
Pajarito at TA-18	06/28	16,000	^{137}Cs	6.0		4.4	1.4
G-6	08/18	1,333	^{137}Cs	5.2	1.3	4.4	1.2
Los Alamos near Los Alamos	10/23	3,030	^{137}Cs	5.1	1.4	4.4	1.2
Los Alamos at Los Alamos	07/18	20,900	^{137}Cs	4.9	0.7	4.4	1.1

[a] Table shows radionuclides found at levels greater than SALs.
[b] Samples with total suspended solids (TSS) concentrations less than 1000 mg/L not included because of larger uncertainty in the calculated concentrations.
[c] Unable to calculate total propogated uncertainty for some samples because of missing estimates of measurement uncertainty.
[d] Screening Action Level; Environmental Restoration 1997; see text for details.

Table 5-15. Chemical Quality of Runoff Samples for 2000 (mg/L[a])

Station Name	Date	Codes[b]	SiO_2	Ca	Mg	K	Na	Cl	SO_4		CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+ NO_2-N	CN (amen)[c]	CN (Total)	TDS[d]	TSS[e]	Lab pH[f]	Conductance (µS/cm)
Runoff Stations																					
Los Alamos Canyon (includes Pueblo, DP Canyons):																					
Los Alamos Canyon at Los Alamos	06/03	F CS		42.0	6.2	12.0	6.7														
Los Alamos Canyon at Los Alamos	06/03	UF CS																	250		
Los Alamos Canyon at Los Alamos	06/03	UF CS		59.0	7.1	13.0	6.8							1.80	0.07	<[a] 0.0100	0.0180		240		
Los Alamos Canyon at Los Alamos	07/18	F CS		58.0	11.0	18.0	4.0														
Los Alamos Canyon at Los Alamos	07/18	UF CS		240.0	20.0	30.0	5.0							0.94	0.67	< 0.0100			9,800		
Los Alamos Canyon at Los Alamos	07/18	UF TOTC															0.1300				
Los Alamos Canyon at Los Alamos	07/18	UF CS																	32,000		
Los Alamos Canyon at Los Alamos	07/19	UF CS																	35,000		
Los Alamos Canyon at Los Alamos	07/19	UF CS																	36,000		
Los Alamos Canyon at Los Alamos	09/12	F CS			10.9			3.6	8.5	185	< 1	186									
Los Alamos Canyon at Los Alamos	09/12	F CS																346			
Los Alamos Canyon at Los Alamos	09/12	F DUP																350			
Los Alamos Canyon at Los Alamos	09/12	UF CS			12.0									0.84	0.06	< 0.0028	< 0.0028				320
Los Alamos Canyon at Los Alamos	09/12	UF DUP														< 0.0028	< 0.0028				
Los Alamos Canyon at Los Alamos	09/12	UF CS																	221		
Los Alamos Canyon at Los Alamos	09/12	UF DUP																	226		
Los Alamos Canyon below TA-2	06/02	UF CS		34.0	5.9	7.6	14.0							0.24	0.09		< 0.0100		4,500		
Los Alamos Canyon below TA-2	06/02	UF CS																	3,400		
Los Alamos Canyon below TA-2	10/23	UF CS			4.7									0.23	< 0.01	< 0.0028	< 0.0028				
Head of DP Canyon	10/23	UF CS														< 0.0028	< 0.0028				
DP Canyon below Meadow at TA-21	07/25	F CS			0.8																
DP Canyon below Meadow at TA-21	07/25	UF CS			1.7											< 0.0028	< 0.0028		302		
DP Canyon below Meadow at TA-21	07/25	UF CS																	298		
DP Canyon below Meadow at TA-21	10/23	F CS																60			
DP Canyon below Meadow at TA-21	10/23	F DUP																66			
DP Canyon below Meadow at TA-21	10/23	UF CS			4.0									0.23	0.12	< 0.0028	< 0.0028				70
DP Canyon below Meadow at TA-21	10/27	F CS			0.5			1.4	2.1	19	< 1	19									
DP Canyon below Meadow at TA-21	10/27	F DUP			0.5																
DP Canyon below Meadow at TA-21	10/27	UF CS			3.7											< 0.0028	< 0.0028		1,700		
DP Canyon below Meadow at TA-21	10/27	UF DUP																	1,840		
DP Canyon at Mouth	06/02	UF CS		35.0	3.0	6.4	6.7							0.81	0.29		< 0.0100		3,300		
DP Canyon at Mouth	06/02	UF CS																	5,800		
DP Canyon at Mouth	10/12	UF CS																	2,750		
DP Canyon at Mouth	10/12	UF DUP																	3,550		
DP Canyon at Mouth	10/12	UF CS																	1,800		
DP Canyon at Mouth	10/12	UF DUP																	4,300		
DP Canyon at Mouth	10/23	F CS																66			
DP Canyon at Mouth	10/23	F DUP																68			
DP Canyon at Mouth	10/23	UF CS			5.9									0.40	0.08	< 0.0028	< 0.0028				69
DP Canyon at Mouth	10/23	UF DUP														< 0.0028	< 0.0028				
DP Canyon at Mouth	10/27	F CS			0.7			2.4	2.8	24.5	< 1	25									
DP Canyon at Mouth	10/27	F CS																104			
DP Canyon at Mouth	10/27	F DUP																92			
DP Canyon at Mouth	10/27	UF CS			9.0											< 0.0028	< 0.0028		4,150		94
DP Canyon at Mouth	10/27	UF DUP																	5,320		
DP Canyon at Mouth	10/27	UF CS																	4,670		
DP Canyon at Mouth	10/27	UF DUP																	5,890		
DP Canyon at Mouth	10/27	UF TRP																	6,110		
Los Alamos Canyon near Los Alamos	06/02	UF CS		61.0	7.7	11.0	11.0							0.82	0.34		< 0.0100		8,800		
Los Alamos Canyon near Los Alamos	06/02	UF CS																	23,000		
Los Alamos Canyon near Los Alamos	06/03	F CS		45.0	6.8	12.0	12.0														
Los Alamos Canyon near Los Alamos	06/03	UF CS																	1,900		

Table 5-15. Chemical Quality of Runoff Samples for 2000 (mg/L[a]) (Cont.)

Station Name	Date	Codes[b]	SiO_2	Ca	Mg	K	Na	Cl	SO_4		CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+ NO_2-N	CN (amen)[c]	CN (Total)	TDS[d]	TSS[e]	Lab pH[f]	Conductance (µS/cm)
Runoff Stations (Cont.)																					
Los Alamos Canyon (includes Pueblo, DP Canyons): (Cont.)																					
Los Alamos Canyon near Los Alamos	06/03	UF CS		96.0	9.5	15.0	12.0							3.70	< 0.05	< 0.0100	0.0280		2,300		
Los Alamos Canyon near Los Alamos	07/09	UF CS		410.0	23.0	32.0	13.0							1.30	1.00	< 0.0100			15,000		
Los Alamos Canyon near Los Alamos	07/09	UF DUP		409.0	22.8	31.6	12.8									< 0.0100			14,800		
Los Alamos Canyon near Los Alamos	07/09	UF TOTC															0.0700				
Los Alamos Canyon near Los Alamos	07/09	F CS		41.0	6.1	14.0	9.4														
Los Alamos Canyon near Los Alamos	07/09	UF CS																	12,000		
Los Alamos Canyon near Los Alamos	10/17	UF CS																	1,680		
Los Alamos Canyon near Los Alamos	10/17	UF DUP																	1,820		
Los Alamos Canyon near Los Alamos	10/17	UF CS																	1,670		
Los Alamos Canyon near Los Alamos	10/17	UF DUP																	1,710		
Los Alamos Canyon near Los Alamos	10/17	UF TRP																	1,790		
Los Alamos Canyon near Los Alamos	10/23	F CS			1.0			4.8	1.6	28.8	< 1	29									
Los Alamos Canyon near Los Alamos	10/23	F CS																102			
Los Alamos Canyon near Los Alamos	10/23	F DUP																110			
Los Alamos Canyon near Los Alamos	10/23	UF CS			6.5											< 0.0028	0.0038		2,880		82
Los Alamos Canyon near Los Alamos	10/23	UF DUP														< 0.0028	0.0051		3,180		
Los Alamos Canyon near Los Alamos	10/23	UF CS																	14,000		
Los Alamos Canyon near Los Alamos	10/23	UF DUP																	15,100		
Los Alamos Canyon near Los Alamos	10/27	F CS			2.6			7.9	4.1	48.9	< 1	49									
Los Alamos Canyon near Los Alamos	10/27	UF CS														< 0.0028	0.0080		3,340		
Los Alamos Canyon near Los Alamos	10/27	UF DUP																	3,480		
Los Alamos Canyon near Los Alamos	10/27	UF TRP																	3,660		
Los Alamos Canyon near Los Alamos	10/30	UF CS														< 0.0028	0.0061		290		
Los Alamos Canyon near Los Alamos	10/30	UF DUP														< 0.0028	< 0.0028		298		
Pueblo Canyon near Los Alamos	10/23	F CS			5.1																
Pueblo Canyon near Los Alamos	10/23	F CS																324			
Pueblo Canyon near Los Alamos	10/23	F DUP																332			
Pueblo Canyon near Los Alamos	10/23	UF CS			20.8									4.38	0.64	0.0032	0.0033				308
Pueblo Canyon near Los Alamos	10/27	UF CS														< 0.0028	0.0153		3,910		
Pueblo Canyon near Los Alamos	10/27	UF DUP																	5,780		
Pueblo Canyon near Los Alamos	10/27	UF CS																	4,110		
Pueblo Canyon near Los Alamos	10/27	UF DUP																	4,120		
Sandia Canyon:																					
Sandia Canyon near TA-3	07/16	UF CS																	270		
Sandia Canyon near TA-3	07/17	UF CS																	740		
Sandia Canyon near TA-3	07/17	UF CS		12.0	2.0	3.0	8.0							0.16	0.53	< 0.0100	< 0.0100		570		
Sandia Canyon near TA-3	10/17	UF CS																	100		
Sandia Canyon near TA-3	10/17	UF DUP																	90		
Sandia Canyon near TA-3	10/17	UF CS																	100		
Sandia Canyon near TA-3	10/17	UF DUP																	110		
Mortandad Canyon (includes Ten Site Canyon, Cañada del Buey):																					
TA-55	07/17	UF CS																	250		
TA-55	07/17	UF CS		8.0	0.8	1.0	1.0							0.14	0.71	< 0.0100	< 0.0100		150		
TA-55	10/07	F CS																< 6			
TA-55	10/07	UF CS			0.6									0.08	0.58	< 0.0028	< 0.0028		58		28
TA-55	10/07	UF DUP			0.6											< 0.0028	< 0.0028				28
TA-55	10/07	UF CS																	111		
TA-55	10/07	UF DUP																	113		
Cañada del Buey near TA-46	10/23	UF CS			6.0											< 0.0028	< 0.0028				
TA-54 MDA J	08/09	F CS																106			

Table 5-15. Chemical Quality of Runoff Samples for 2000 (mg/L[a]) (Cont.)

Station Name	Date	Codes[b]	SiO_2	Ca	Mg	K	Na	Cl	SO_4		CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+ NO_2-N	CN (amen)[c]	CN (Total)	TDS[d]	TSS[e]	Lab pH[f]	Conductance (µS/cm)
Runoff Stations (Cont.)																					
Mortandad Canyon (includes Ten Site Canyon, Cañada del Buey): (Cont.)																					
TA-54 MDA J	08/09	F DUP																106			
TA-54 MDA J	08/09	UF CS			18.0														4,290		45
TA-54 MDA J	08/09	UF DUP			17.8																
TA-54 MDA J	08/09	UF CS																	2,310		
TA-54 MDA J	07/15	UF CS																	50		
TA-54 MDA J	07/15	UF CS		18.0	1.0	1.0	1.0							0.09	1.00				70		93
TA-54 MDA J	07/15	UF DUP																	73		94
TA-54 MDA J	07/17	UF CS																	87		
TA-54 MDA J	07/17	UF CS														< 0.0100	< 0.0100		37		
TA-54 MDA J	10/07	F CS																17			
TA-54 MDA J	10/07	F DUP																19			
TA-54 MDA J	10/07	UF CS			0.5									0.10	0.81	< 0.0028	< 0.0028		32		34
TA-54 MDA J	10/07	UF DUP																	35		
TA-54 MDA J	10/07	UF CS																	75		
TA-54 MDA J	10/07	UF DUP																	90		
TA-54 MDA G-6	07/29	F CS			14.2																
TA-54 MDA G-6	07/29	F CS																254			
TA-54 MDA G-6	07/29	F DUP																264			
TA-54 MDA G-6	07/29	UF CS			31.5									1.03	0.47				3,810		306
TA-54 MDA G-6	07/29	UF CS																	4,260		
TA-54 MDA G-6	08/09	F CS																161			
TA-54 MDA G-6	08/09	UF CS														< 0.0028	0.0031		6,230		22,100
TA-54 MDA G-6	08/09	UF DUP														< 0.0028	0.0038				
TA-54 MDA G-6	08/09	UF CS																	5,560		
TA-54 MDA G-6	08/18	F CS			7.9																
TA-54 MDA G-6	08/18	F CS																210			
TA-54 MDA G-6	08/18	F DUP																205			
TA-54 MDA G-6	08/18	F TRP																217			
TA-54 MDA G-6	08/18	UF CS			16.3			32.8	1.6					0.49	0.24	0.0030	0.0097		1,390		132
TA-54 MDA G-6	08/18	UF DUP														< 0.0028	0.0081		1,340		132
TA-54 MDA G-6	08/18	UF CS																	1,250		
TA-54 MDA G-6	08/18	UF DUP																	1,350		
TA-54 MDA G-6	10/11	F CS			2.7			10.0	1.0	19.5	< 1	20									
TA-54 MDA G-6	10/11	F DUP						9.9	1.1	19	< 1	19									
TA-54 MDA G-6	10/11	F CS																137			76
TA-54 MDA G-6	10/11	F DUP																144			
TA-54 MDA G-6	10/11	F TRP																142			
TA-54 MDA G-6	10/11	UF CS			10.1									0.43	0.07	< 0.0028	< 0.0028		3,000		
TA-54 MDA G-6	10/11	UF DUP			10.0											< 0.0028	< 0.0028		3,290		
TA-54 MDA G-6	10/11	UF TRP																	3,100		
TA-54 MDA G-6	10/11	UF CS																	6,020		
TA-54 MDA G-6	10/11	UF DUP																	7,080		
Cañada del Buey at White Rock	07/29	F CS																312			
Cañada del Buey at White Rock	07/29	UF CS			86.9									5.67	0.15	< 0.0028	< 0.0028		19,600		10,600
Cañada del Buey at White Rock	07/29	UF DUP																			10,600
Cañada del Buey at White Rock	07/29	F CS			1.8																
Cañada del Buey at White Rock	07/29	UF CS																	38,300		
Cañada del Buey at White Rock	08/09	UF CS																	15,300		
Cañada del Buey at White Rock	08/09	UF DUP																	16,700		
Cañada del Buey at White Rock	08/09	UF CS																	18,900		
Cañada del Buey at White Rock	08/18	F CS																210			
Cañada del Buey at White Rock	08/18	F DUP																214			

Table 5-15. Chemical Quality of Runoff Samples for 2000 (mg/L[a]) (Cont.)

Station Name	Date	Codes[b]	SiO_2	Ca	Mg	K	Na	Cl	SO_4		CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+ NO_2-N	CN (amen)[c]	CN (Total)	TDS[d]	TSS[e]	Lab pH[f]	Conductance (µS/cm)
Runoff Stations (Cont.)																					
Mortandad Canyon (includes Ten Site Canyon, Cañada del Buey): (Cont.)																					
Cañada del Buey at White Rock	08/18	UF CS												3.12	0.33	< 0.0028	< 0.0028		15,700		125
Cañada del Buey at White Rock	08/18	UF DUP																	16,400		
Canada del Buey at White Rock	08/18	UF QUD																	16,300		
Canada del Buey at White Rock	08/18	UF TRP																	10,500		
Canada del Buey at White Rock	08/18	F CS			0.9																
Canada del Buey at White Rock	08/18	UF CS			31.6											< 0.0028	< 0.0028		9,160		
Cañada del Buey at White Rock	08/18	UF DUP																	9,910		
Cañada del Buey at White Rock	08/18	UF CS																	14,500		
Cañada del Buey at White Rock	08/18	UF DUP																	8,520		
Cañada del Buey at White Rock	10/11	UF CS			20.7									2.31	0.11	< 0.0028	< 0.0028		13,700		
Cañada del Buey at White Rock	10/11	UF DUP																	15,100		
Cañada del Buey at White Rock	10/11	UF CS																	10,600		
Cañada del Buey at White Rock	10/11	UF DUP																	14,800		
Cañada del Buey at White Rock	10/23	F CS																252			
Cañada del Buey at White Rock	10/23	F DUP																254			
Cañada del Buey at White Rock	10/23	UF CS			24.8									1.45	0.09	< 0.0028	0.0036		11,300		66
Cañada del Buey at White Rock	10/23	UF DUP																	9,500		
Cañada del Buey at White Rock	10/23	UF CS																	19,600		
Cañada del Buey at White Rock	10/23	UF DUP																	25,100		
Cañada del Buey at White Rock	10/28	F CS			1.4			0.3	0.4	17.6	< 0.3	18									
Cañada del Buey at White Rock	10/28	F CS																240			
Cañada del Buey at White Rock	10/28	F DUP																252			
Cañada del Buey at White Rock	10/28	UF CS			7.0									0.90	0.02	< 0.0028	0.0038		6,360		57
Cañada del Buey at White Rock	10/28	UF DUP																	6,400		
Cañada del Buey at White Rock	10/28	UF CS																	7,080		
Cañada del Buey at White Rock	10/28	UF DUP																	7,930		
Pajarito Canyon (includes Two-Mile, Three-Mile Canyons):																					
Pajarito Canyon above Highway 501	06/28	F CS		63.0	12.0	21.0	5.1														
Pajarito Canyon above Highway 501	06/28	UF CS												2.50	0.38	< 0.0500			25,000		
Pajarito Canyon above Highway 501	06/28	UF TOTC		1,110.0	112.8	111.3	11.7										0.1460				
Pajarito Canyon above Highway 501	06/28	UF CS																	35,000		
Pajarito Canyon above Highway 501	09/08	F CS			4.8			2.2	9.8	70.3	< 1	70									
Pajarito Canyon above Highway 501	09/08	F CS																273			215
Pajarito Canyon above Highway 501	09/08	F DUP																281			214
Pajarito Canyon above Highway 501	09/08	UF CS			30.9									8.45	0.85	< 0.0028	0.0218		9,740		
Pajarito Canyon above Highway 501	09/08	UF DUP			31.4									8.70							
Pajarito Canyon above Highway 501	09/08	UF CS																	8,200		
Pajarito Canyon above Highway 501	10/23	F CS			5.4			1.5	4.6	78.2	< 1	78									
Pajarito Canyon above Highway 501	10/23	F CS																171			
Pajarito Canyon above Highway 501	10/23	F DUP																349			
Pajarito Canyon above Highway 501	10/23	UF CS			7.8									1.71	0.31	< 0.0028	0.0072		414		182
Pajarito Canyon above Highway 501	10/23	UF DUP	20	35.9	7.7	11.3	3.2							1.81		0.0031	0.0078		470		182
Pajarito Canyon above Highway 501	10/23	UF TRP																	414		
Pajarito Canyon above Highway 501	10/23	UF CS																	442		
Pajarito Canyon above Highway 501	10/23	UF CS														< 0.0028	0.0173		7,640		
Pajarito Canyon above Highway 501	10/23	UF DUP																	6,380		
Pajarito Canyon above Highway 501	10/23	UF TRP																	6,380		
Pajarito Canyon at TA-22	06/28	F CS		54.0	11.0	18.0	5.2														
Pajarito Canyon at TA-22	06/28	UF CS												0.89	1.10	< 0.0500			2,600		
Pajarito Canyon at TA-22	06/28	UF DUP																	2,620		
Pajarito Canyon at TA-22	06/28	UF TOTC		157.2	24.1	34.9	8.0										0.1150				

Table 5-15. Chemical Quality of Runoff Samples for 2000 (mg/L[a]) (Cont.)

Station Name	Date	Codes[b]	SiO_2	Ca	Mg	K	Na	Cl	SO_4		CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+ NO_2-N	CN (amen)[c]	CN (Total)	TDS[d]	TSS[e]	Lab pH[f]	Conductance (µS/cm)
Runoff Stations (Cont.)																					
Pajarito Canyon (includes Two-Mile, Three-Mile Canyons): (Cont.)																					
Pajarito Canyon at TA-22	06/28	UF CS																	2,000		
Starmer's Gulch at TA-22	06/28	F CS		62.0	10.0	22.0	8.6														
Starmer's Gulch at TA-22	06/28	UF CS												5.90	0.52	< 0.0500			3,100		
Starmer's Gulch at TA-22	06/28	UF TOTC		291.6	26.7	41.9	10.9										0.0840				
Starmer's Gulch at TA-22	06/28	UF CS																	2,900		
TA-54 MDA G-1	08/09	F CS																105			
TA-54 MDA G-1	08/09	UF CS												2.22	0.31				13,300		15,300
TA-54 MDA G-1	08/09	UF DUP												2.16	0.34						
TA-54 MDA G-1	08/09	UF CS																	12,900		
TA-54 MDA G-1	10/11	F CS			0.6			0.5	0.5	8.24	< 1	8									
TA-54 MDA G-1	10/11	F CS																84			
TA-54 MDA G-1	10/11	F DUP																87			
TA-54 MDA G-1	10/11	UF CS			7.4									0.31	0.06	< 0.0028	< 0.0028		1,040		29
TA-54 MDA G-1	10/11	UF DUP																	1,090		
TA-54 MDA G-1	10/11	UF CS																	677		
TA-54 MDA G-1	10/11	UF DUP																	760		
TA-54 MDA G-2	07/29	F CS			39.3																
TA-54 MDA G-2	07/29	F CS																280			
TA-54 MDA G-2	07/29	UF CS			46.9									0.73	0.53	< 0.0028	< 0.0028		1,640		573
TA-54 MDA G-2	07/29	UF DUP																	1,730		
TA-54 MDA G-2	07/29	UF CS																	1,490		
TA-54 MDA G-2	08/09	F CS			8.7																
TA-54 MDA G-2	08/09	UF CS			23.9														4,830		
TA-54 MDA G-2	08/09	UF CS																	4,860		
TA-54 MDA G-2	10/11	F CS			11.4			53.2	1.3	29.3	< 1	29									
TA-54 MDA G-2	10/11	F CS																231			
TA-54 MDA G-2	10/11	F DUP																232			
TA-54 MDA G-2	10/11	UF CS			17.7									0.22	0.20	< 0.0028	< 0.0028		570		159
TA-54 MDA G-2	10/11	UF DUP																	582		
TA-54 MDA G-2	10/11	UF CS																	510		
TA-54 MDA G-2	10/11	UF DUP																	514		
TA-54 MDA G-3	07/29	F CS																346			
TA-54 MDA G-3	07/29	UF CS			33.6									2.14	0.87	< 0.0028	< 0.0028		10,300		315
TA-54 MDA G-3	08/09	UF CS																	35,800		
TA-54 MDA G-3	08/09	UF CS																	37,800		
TA-54 MDA G-3	08/18	F CS			13.8																
TA-54 MDA G-3	08/18	F CS																333			
TA-54 MDA G-3	08/18	F DUP																345			
TA-54 MDA G-3	08/18	UF CS			20.0									0.86	0.67	< 0.0028	< 0.0028		5,560		357
TA-54 MDA G-3	08/18	UF DUP																	5,270		
TA-54 MDA G-3	08/18	UF CS																	6,040		
TA-54 MDA G-3	08/18	UF DUP																	7,110		
TA-54 MDA G-3	10/11	F CS			3.0			13.0	3.9	25.2	< 1	25									
TA-54 MDA G-3	10/11	F CS																162			
TA-54 MDA G-3	10/11	F DUP																166			
TA-54 MDA G-3	10/11	UF CS			6.5									0.41	0.26	< 0.0028	< 0.0028		610		102
TA-54 MDA G-3	10/11	UF DUP																	638		
TA-54 MDA G-3	10/11	UF CS																	620		
TA-54 MDA G-3	10/11	UF DUP																	620		
TA-54 MDA G-3	10/11	UF TRP																	628		
TA-54 MDA G-3	10/25	F CS			2.1			6.7	2.5	21.6	< 1	22									
TA-54 MDA G-3	10/25	UF CS			11.1									0.18	0.81	< 0.0028	< 0.0028				

Table 5-15. Chemical Quality of Runoff Samples for 2000 (mg/L[a]) (Cont.)

Station Name	Date	Codes[b]	SiO_2	Ca	Mg	K	Na	Cl	SO_4		CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+NO_2-N	CN (amen)[c]	CN (Total)	TDS[d]	TSS[e]	Lab pH[f]	Conductance (µS/cm)
Runoff Stations (Cont.)																					
Pajarito Canyon (includes Two-Mile, Three-Mile Canyons): (Cont.)																					
TA-54 MDA G-3	10/28	F CS			2.4																
TA-54 MDA G-3	10/28	UF CS														< 0.0028	< 0.0028		392		
TA-54 MDA G-3	10/28	UF DUP																	402		
TA-54 MDA G-3	10/28	UF CS																	444		
TA-54 MDA G-3	10/28	UF DUP																	448		
TA-54 MDA G-5	10/23	F CS			0.5																
TA-54 MDA G-5	10/23	F CS																49			
TA-54 MDA G-5	10/23	F DUP																50			
TA-54 MDA G-5	10/23	UF CS			1.5									0.13	0.08	< 0.0028	< 0.0028		214		22
TA-54 MDA G-5	10/23	UF DUP												0.15					270		
TA-54 MDA G-5	10/23	UF CS																	2,640		
TA-54 MDA G-5	10/23	UF DUP																	2,670		
TA-54 MDA G-4	08/15	F CS																90			
TA-54 MDA G-4	08/15	F DUP																87			
TA-54 MDA G-4	08/15	UF CS			3.4									0.36	1.27	0.0035	0.0060		1,410		96
TA-54 MDA G-4	08/15	UF DUP			3.3									0.32		< 0.0028	0.0051		1,450		95
TA-54 MDA G-4	08/15	UF CS																	2,930		
TA-54 MDA G-4	10/12	F CS			2.7			8.8	4.3	50.9	< 1	51									
TA-54 MDA G-4	10/12	F CS																146			
TA-54 MDA G-4	10/12	F DUP																153			
TA-54 MDA G-4	10/12	F TRP																153			
TA-54 MDA G-4	10/12	UF CS			3.4									0.20	0.15	< 0.0028	< 0.0028		80		139
TA-54 MDA G-4	10/12	UF DUP																	82		
TA-54 MDA G-4	10/12	UF CS																	70		
TA-54 MDA G-4	10/12	UF DUP																	76		
Pajarito Canyon above Highway 4	06/28	F CS		97.0	16.0	32.0	7.4														
Pajarito Canyon above Highway 4	06/28	UF CS												0.98	0.11	< 0.0500			2,400		
Pajarito Canyon above Highway 4	06/28	UF TOTC		706.0	52.9	65.6	10.4										0.0850				
Pajarito Canyon above Highway 4	06/28	UF CS																	6,000		
Pajarito Canyon above Highway 4	10/24	F CS			4.6			6.7	11.0	84.4	< 1	85									
Pajarito Canyon above Highway 4	10/24	F DUP						6.6	10.7												
Pajarito Canyon above Highway 4	10/24	F CS																264			
Pajarito Canyon above Highway 4	10/24	F DUP																276			
Pajarito Canyon above Highway 4	10/24	F TRP																268			
Pajarito Canyon above Highway 4	10/24	UF CS			9.6									1.34	0.94	< 0.0028	< 0.0028				226
Pajarito Canyon above Highway 4	10/27	F CS			5.0			6.4	13.9	80.1	< 1	80									
Pajarito Canyon above Highway 4	10/27	F CS																250			
Pajarito Canyon above Highway 4	10/27	F DUP																252			
Pajarito Canyon above Highway 4	10/27	UF CS			10.5									0.97	0.41	< 0.0028	0.0072		752		210
Pajarito Canyon above Highway 4	10/27	UF DUP														< 0.0028	0.0070		772		
Pajarito Canyon above Highway 4	10/28	UF CS																	1,700		
Pajarito Canyon above Highway 4	10/28	UF DUP																	1,710		
Water Canyon (includes Cañon del Valle, Potrillo, Fence, Indio Canyons):																					
Water Canyon above Highway 501	06/28	UF CS												0.74	0.60	0.0620			1,000		
Water Canyon above Highway 501	06/28	UF TOTC		573.7	33.7	43.3	4.7										0.0660				
Water Canyon above Highway 501	06/28	UF CS																	1,600		
Water Canyon above Highway 501	10/23	F CS			3.8			1.4	3.9	61.8	< 1	62									
Water Canyon above Highway 501	10/23	F CS																436			
Water Canyon above Highway 501	10/23	F DUP																438			
Water Canyon above Highway 501	10/23	UF CS			29.2									6.90	0.21	< 0.0028	0.0176		15,600		253
Water Canyon above Highway 501	10/23	UF DUP																	16,400		

Table 5-15. Chemical Quality of Runoff Samples for 2000 (mg/L[a]) (Cont.)

Station Name	Date	Codes[b]	SiO_2	Ca	Mg	K	Na	Cl	SO_4		CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+ NO_2-N	CN (amen)[c]	CN (Total)	TDS[d]	TSS[e]	Lab pH[f]	Conductance (µS/cm)
Runoff Stations (Cont.)																					
Water Canyon (includes Cañon del Valle, Potrillo, Fence, Indio Canyons): (Cont.)																					
Water Canyon above Highway 501	10/23	UF CS																	11,100		
Water Canyon above Highway 501	10/23	UF DUP																	13,100		
Cañon del Valle above Highway 501	06/28	UF CS												0.85	0.78	< 0.0500			3,400		
Cañon del Valle above Highway 501	06/28	UF TOTC		666.0	46.4	55.8	7.0										0.0920				
Cañon del Valle above Highway 501	06/28	UF CS																	3,100		
Cañon del Valle above Highway 501	10/23	F CS			3.4			1.2	4.0	64.9	< 1	65									
Cañon del Valle above Highway 501	10/23	F CS																292			
Cañon del Valle above Highway 501	10/23	F DUP																298			
Cañon del Valle above Highway 501	10/23	UF CS			17.0									7.40	0.36	< 0.0028	0.0145		4,970		245
Cañon del Valle above Highway 501	10/23	UF DUP																	7,610		
Cañon del Valle above Highway 501	10/23	UF CS																	2,840		
Cañon del Valle above Highway 501	10/23	UF DUP																	5,350		
Water Canyon at Highway 4	06/28	UF CS												0.72	0.69	< 0.0500			5,000		
Water Canyon at Highway 4	06/28	UF TOTC		688.4	58.4	64.9	8.9										0.0720				
Water Canyon at Highway 4	10/27	F CS			5.4			2.4	7.1	39.1	< 1	39									
Water Canyon at Highway 4	10/27	F DUP								38.1	< 1	38									
Water Canyon at Highway 4	10/27	F CS																486			
Water Canyon at Highway 4	10/27	F DUP																492			
Water Canyon at Highway 4	10/27	UF CS			37.4									5.10	0.09	< 0.0028	0.0495		51,400		357
Water Canyon at Highway 4	10/27	UF DUP			37.6									5.05					52,800		355
Water Canyon at Highway 4	10/27	UF TRP																	53,500		
Water Canyon at Highway 4	10/28	UF CS																	61,900		
Water Canyon at Highway 4	10/28	UF DUP																	62,400		
Water Canyon at Highway 4	10/28	UF TRP																	65,800		
Indio Canyon at Highway 4	06/28	UF CS																	12,000		
Water Canyon below Highway 4	06/28	F CS		80.0	14.0	28.0	5.9														
Water Canyon below Highway 4	06/28	UF CS												0.63	0.56	< 0.0500			13,000		
Water Canyon below Highway 4	06/28	UF TOTC		971.7	87.3	95.2	11.1										0.1030				
Water Canyon below Highway 4	06/28	UF CS																	5,800		
Water Canyon below Highway 4	07/29	UF CS			55.0									14.40	< 0.01	0.0393	0.0639		20,300		
Water Canyon below Highway 4	07/29	UF DUP			61.4									14.50	< 0.01	0.0457	0.0738				
Water Canyon below Highway 4	07/29	UF CS																	21,300		
Water Canyon below Highway 4	08/12	UF CS			37.5														59,600		
Water Canyon below Highway 4	08/12	UF CS																	46,000		
Water Canyon below Highway 4	08/18	F CS			1.8																
Water Canyon below Highway 4	08/18	F CS																126			
Water Canyon below Highway 4	08/18	F DUP																138			
Water Canyon below Highway 4	08/18	UF CS			3.9									0.93	0.43	0.0058	0.0066		284		102
Water Canyon below Highway 4	08/18	UF DUP			3.9														294		
Water Canyon below Highway 4	08/18	UF CS																	334		
Water Canyon below Highway 4	08/18	UF DUP																	322		
Water Canyon below Highway 4	08/18	UF QUD																	332		
Water Canyon below Highway 4	08/18	UF TRP																	344		
Water Canyon below Highway 4	10/23	F CS			4.9			5.0	6.8	84.3	< 1	85									
Water Canyon below Highway 4	10/23	F CS																362			
Water Canyon below Highway 4	10/23	F DUP																372			
Water Canyon below Highway 4	10/23	UF CS			28.6									5.10	0.06	< 0.0028	< 0.0028		23,500		288
Water Canyon below Highway 4	10/23	UF DUP			29.0											< 0.0028	< 0.0028		24,100		
Water Canyon below Highway 4	10/23	UF CS																	54,700		
Water Canyon below Highway 4	10/23	UF DUP																	54,700		
Water Canyon below Highway 4	10/23	UF TRP																	71,400		
Water Canyon below Highway 4	10/27	F CS			3.1			1.8	6.8	47.9	< 1	48									

Table 5-15. Chemical Quality of Runoff Samples for 2000 (mg/L[a]) (Cont.)

Station Name	Date	Codes[b]	SiO_2	Ca	Mg	K	Na	Cl	SO_4		CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+ NO_2-N	CN (amen)[c]	CN (Total)	TDS[d]	TSS[e]	Lab pH[f]	Conductance (µS/cm)
Runoff Stations (Cont.)																					
Water Canyon (includes Cañon del Valle, Potrillo, Fence, Indio Canyons): (Cont.)																					
Water Canyon below Highway 4	10/27	UF CS			22.0											< 0.0028	0.0352		11,200		
Water Canyon below Highway 4	10/27	UF DUP																	13,700		
Water Canyon below Highway 4	10/27	UF TRP																	13,900		
Water Canyon below Highway 4	10/27	UF CS																	9,340		
Water Canyon below Highway 4	10/27	UF DUP																	9,860		
Potrillo Canyon near White Rock	08/09	UF CS			19.7									1.72	0.44	< 0.0028	0.0037		6,970		
Potrillo Canyon near White Rock	08/09	UF CS																	14,000		
Potrillo Canyon near White Rock	10/23	F CS			0.7			0.4	0.5	25.7	< 1	26									
Potrillo Canyon near White Rock	10/23	F CS																194			
Potrillo Canyon near White Rock	10/23	F DUP																390			
Potrillo Canyon near White Rock	10/23	UF CS			9.0									0.58	0.10	< 0.0028	< 0.0028		5,170		25
Potrillo Canyon near White Rock	10/23	UF DUP																	5,610		
Potrillo Canyon near White Rock	10/23	UF CS																	13,500		
Potrillo Canyon near White Rock	10/23	UF DUP																	9,760		
Ancho Canyon:																					
Ancho Canyon at TA-39	08/18	UF CS			73.5														19,400		
Ancho Canyon at TA-39	08/18	UF DUP																	20,600		
Ancho Canyon at TA-39	08/18	UF CS																	30,000		
Ancho Canyon at TA-39	08/18	UF DUP																	30,200		
Ancho Canyon at TA-39	10/28	F CS						0.9	1.4	12.7	< 1	13									
Ancho Canyon at TA-39	10/28	F CS																170			
Ancho Canyon at TA-39	10/28	F DUP																196			
Ancho Canyon at TA-39	10/28	F TRP																187			
Ancho Canyon at TA-39	10/28	UF CS			17.0											< 0.0028	< 0.0028		2,750		57
Ancho Canyon at TA-39	10/28	UF DUP																	2,790		
Ancho Canyon at TA-39	10/28	UF CS																	1,990		
Ancho Canyon at TA-39	10/28	UF DUP																	2,000		
Ancho Canyon near Bandelier NP	08/18	UF CS			52.7														7,420		
Ancho Canyon near Bandelier NP	08/18	UF DUP			51.6														8,610		
Ancho Canyon near Bandelier NP	08/18	UF CS																	10,500		
Ancho Canyon near Bandelier NP	08/18	UF DUP																	11,500		
Ancho Canyon near Bandelier NP	10/23	F CS																152			
Ancho Canyon near Bandelier NP	10/23	UF CS			12.4			0.4	1.1	21.6	< 1	22		0.55	0.14	< 0.0028	< 0.0028		4,230		53
Ancho Canyon near Bandelier NP	10/23	UF DUP																	5,300		
Ancho Canyon near Bandelier NP	10/23	UF CS																	4,220		
Ancho Canyon near Bandelier NP	10/23	UF DUP																	4,840		
Ancho Canyon near Bandelier NP	10/28	F CS																138			
Ancho Canyon near Bandelier NP	10/28	F DUP																141			
Ancho Canyon near Bandelier NP	10/28	UF CS			9.3											< 0.0028	0.0036		2,540		45
Ancho Canyon near Bandelier NP	10/28	UF DUP																	2,700		
Ancho Canyon near Bandelier NP	10/28	UF CS																	2,870		
Ancho Canyon near Bandelier NP	10/28	UF DUP																	2,880		
Runoff Grab Samples																					
Upper Los Alamos Reservoir	08/31	F CS	38	62.3	12.7	14.7	7.8	3.1	3.0	101	1	102	0.10	0.16	0.15			180			196
Upper Los Alamos Reservoir	08/31	F DUP																187			
Upper Los Alamos Reservoir	08/31	UF CS			7.8									0.18	0.10	< 0.0028	< 0.0028		< 7		
Upper Los Alamos Reservoir	08/31	UF DUP																	< 7		
Los Alamos Reservoir	08/31	F CS	42	26.7	7.6	5.6	6.6	3.4	0.6	229	< 1	230	0.10	0.42	0.08			333			365
Los Alamos Reservoir	08/31	F DUP																335			364
Los Alamos Reservoir	08/31	F TRP																359			

Table 5-15. Chemical Quality of Runoff Samples for 2000 (mg/L[a]) (Cont.)

Station Name	Date	Codes[b]	SiO_2	Ca	Mg	K	Na	Cl	SO_4		CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+ NO_2-N	CN (amen)[c]	CN (Total)	TDS[d]	TSS[e]	Lab pH[f]	Conductance (µS/cm)
Runoff Grab Samples (Cont.)																					
Los Alamos Reservoir	08/31	UF CS																		7.2	
Los Alamos Reservoir	08/31	UF CS			12.4									0.60	0.02	< 0.0028	< 0.0028		38	7.2	
Los Alamos Reservoir	08/31	UF DUP			12.5											< 0.0028	< 0.0028				
Los Alamos Canyon at SR-4 Weir	07/21	F CS			13.1																
Los Alamos Canyon at SR-4 Weir	07/21	UF CS			18.0											< 0.0028	0.0101		885		
Los Alamos Canyon at SR-4 Weir	07/21	UF DUP			18.2											< 0.0028	0.0120		890		
Los Alamos Canyon at SR-4 Weir	07/21	UF CS																	935		
Rendija Canyon at 3rd Crossing	07/17	UF CS																	38,000		
Rendija Canyon at 3rd Crossing	07/17	F CS		36.0	6.0	10.0	2.0														
Rendija Canyon at 3rd Crossing	07/17	UF CS		250.0	22.0	25.0	3.0							0.58	0.50						
Rendija Canyon at 3rd Crossing	07/17	UF DUP		300.0	26.0	30.0	4.0														
Guaje Canyon at SR-502	07/09	F CS		51.0	9.0	14.0	4.1														
Guaje Canyon at SR-502	07/09	UF CS		620.0	39.0	38.0	7.3							0.71	0.93	< 0.0100			37,000		
Guaje Canyon at SR-502	07/09	UF TOTC															0.1760				
Guaje Canyon at SR-502	07/09	UF CS																	33,000		
Guaje Canyon at SR-502	09/08	F CS			7.1			2.4	16.7	118	< 1	118									
Guaje Canyon at SR-502	09/08	F CS																570			
Guaje Canyon at SR-502	09/08	UF CS			188.0									8.60	0.39	< 0.0028	0.0196				427
Guaje Canyon at SR-502	09/08	UF CS																	76,000		
Starmer's Gulch above Highway 501	10/23	F CS			4.7			2.0	4.3	50.5	< 1	51									
Starmer's Gulch above Highway 501	10/23	F CS																426			
Starmer's Gulch above Highway 501	10/23	F DUP																436			
Starmer's Gulch above Highway 501	10/23	UF CS			19.4									7.26	0.10	< 0.0028	0.0103		6,240		274
Starmer's Gulch above Highway 501	10/23	UF DUP												7.35	0.10				6,260		
Starmer's Gulch above Highway 501	10/23	UF TRP																	8,930		
Starmer's Gulch above Highway 501	10/23	UF CS																	1,740		
Starmer's Gulch above Highway 501	10/23	UF DUP																	2,590		
Two-Mile Canyon at Highway 501	10/23	F CS			2.8			1.8	4.2	62.8	< 1	63									
Two-Mile Canyon at Highway 501	10/23	F DUP								63.8	< 1	64									
Two-Mile Canyon at Highway 501	10/23	F CS																312			
Two-Mile Canyon at Highway 501	10/23	F DUP																314			
Two-Mile Canyon at Highway 501	10/23	UF CS			19.4									8.15	0.14	< 0.0028	0.0111		8,080		270
Two-Mile Canyon at Highway 501	10/23	UF DUP																	7,080		
Two-Mile Canyon at Highway 501	10/23	UF CS																	10,900		
Two-Mile Canyon at Highway 501	10/23	UF DUP																	9,980		
Pajarito Canyon at TA-18 Culvert	06/28	F CS		85.0	14.0	29.0	7.0														
Pajarito Canyon at TA-18 Culvert	06/28	F DUP		84.7	14.2	28.7	7.0														
Pajarito Canyon at TA-18 Culvert	06/28	UF CS												0.98	0.52	< 0.0500			16,000		
Pajarito Canyon at TA-18 Culvert	06/28	UF TOTC		877.3	81.1	96.2	11.8										0.1750				
Pajarito Canyon at TA-18 Culvert	06/28	UF CS																	18,000		
Pajarito Canyon at TA-18 Culvert	06/28	UF DUP																	27,500		
Pajarito Canyon at G-1	06/28	UF CS																	3,200		
Pajarito Canyon at G-1	06/28	UF CS																	21,000		
Pajarito Canyon at SR-4 Culvert	06/28	F CS		99.0	17.0	32.0	7.8														
Pajarito Canyon at SR-4 Culvert	06/28	UF CS												3.70	0.67	< 0.0500			5,700		
Pajarito Canyon at SR-4 Culvert	06/28	UF TOTC		774.9	73.4	91.5	11.8										0.0970				
Pajarito Canyon at SR-4 Culvert	06/28	UF CS																	1,600		
Water Quality Standards[h]																					
EPA Primary Drinking Water Standard									500				4.0		10		0.2000				
EPA Secondary Drinking Water Standard								250	250									500		6.8-8.5	
EPA Health Advisory							20														
NMWQCC Groundwater Limit								250	500				1.6		10		0.2000	1,000		6-9	
NMWQCC Wildlife Habitat Standard																0.0052					

Table 5-15. Chemical Quality of Runoff Samples for 2000 (mg/L[a])

[a] Except where noted.
[b] Codes: UF–Unfiltered; F–Filtered; CS–Customer Sample; DUP–Laboratory Duplicate; TRP–Laboratory Triplicate; TOTC–Total Concentration Calculated from Laboratory Data.
[c] Amenable cyanide.
[d] Total dissolved solids.
[e] Total suspended solids.
[f] Standard units.
[g] Less than symbol (<) means measurement was below the specified limit of detection of the analytical method.
[h] Standards given here for comparison only; see Appendix A.

Table 5-16. Trace Metals in Runoff Samples for 2000 (µg/L)

Station Name	Date	Code[a,b]	Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe
Runoff Stations													
Los Alamos Canyon (includes Pueblo, DP Canyons):													
Los Alamos Canyon at Los Alamos	06/03	F CS	<[c] 0.9	89	3.4	67.0	120.0	0.1	0.3	3.9	< 0.4	2.5	87
Los Alamos Canyon at Los Alamos	06/03	UF CS	< 0.9	2,900	7.1	74.0	370.0	1.0	0.8	6.1	1.4	6.8	2,000
Los Alamos Canyon at Los Alamos	07/18	F CS						0.0	< 0.1				332
Los Alamos Canyon at Los Alamos	07/18	UF CS						17.6	8.5				121,000
Los Alamos Canyon at Los Alamos	07/18	UF DUP						20.7	9.1				166,000
Los Alamos Canyon at Los Alamos	07/18	F CS	10.0	220	4.4	87.0	170.0	< 5.0	< 5.0	6.7	0.8	6.9	130
Los Alamos Canyon at Los Alamos	07/18	UF CS	1.1	18,000	14.0	317,000.0	2,000.0	9.1	3.7	43.0	4.3	17.0	5,000
Los Alamos Canyon at Los Alamos	09/12	F CS	< 0.5	377	5.0	54.1	157.0	0.5	< 0.1	6.4	< 1.1	1.6	375
Los Alamos Canyon at Los Alamos	09/12	UF CS	< 0.5	8,660	7.2	48.7	287.0	1.3	0.7	8.1	2.6	9.2	4,560
Los Alamos Canyon below TA- 2	06/02	UF CS	< 0.9	4,300	6.6	31.0	530.0	9.9	4.1	17.0	6.8	64.0	5,200
Los Alamos Canyon below TA- 2	10/23	UF CS	< 0.5	6,090	< 2.6	23.9	98.7	0.9	0.3	0.8	3.1	5.6	3,830
DP Canyon below Meadow at TA-21	07/25	F CS	< 0.5	86	< 2.6	24.9	16.7	0.5	0.2	< 0.6	< 1.1	9.5	75
DP Canyon below Meadow at TA-21	07/25	UF CS	< 0.5	5,090	< 2.6	19.6	75.3	0.9	0.5	3.6	6.2	25.9	3,860
DP Canyon below Meadow at TA-21	10/23	UF CS	< 0.5	20,400	5.7		230.0	2.7	1.2	6.3	20.9	55.4	17,000
DP Canyon below Meadow at TA-21	10/27	F CS	< 0.5	679	3.8	11.2	16.6	0.5	< 0.1	< 0.6	1.7	3.1	401
DP Canyon below Meadow at TA-21	10/27	F DUP	< 0.5	665	< 2.6	10.6	16.4	0.5	< 0.1	< 0.6	1.6	2.7	397
DP Canyon below Meadow at TA-21	10/27	UF CS	0.7	18,600	4.4	18.7	293.0	3.9	1.4	9.0	15.8	48.8	13,000
DP Canyon at Mouth	06/02	UF CS	< 0.9	5,400	5.3	28.0	510.0	11.8	4.3	17.0	6.3	58.0	3,600
DP Canyon at Mouth	10/23	UF CS	< 0.5	33,000	10.1		363.0	6.3	2.0	10.1	28.8	64.0	26,900
DP Canyon at Mouth	10/27	F CS	< 0.5	1,040	< 2.6	15.2	22.9	0.6	< 0.1	< 0.6	1.0	2.1	584
DP Canyon at Mouth	10/27	UF CS	0.8	48,800	10.4	40.4	760.0	14.2	3.5	25.2	41.9	108.0	37,500
Los Alamos Canyon near Los Alamos	06/02	UF CS	< 0.9	8,800	6.4	40.0	890.0	20.5	8.0	30.0	11.0	95.0	5,900
Los Alamos Canyon near Los Alamos	06/03	F CS	< 0.9	59	< 3.0	66.0	110.0	0.1	0.3	1.1	< 0.4	2.0	76
Los Alamos Canyon near Los Alamos	06/03	UF CS	< 0.9	8,700	8.1	81.0	830.0	5.0	3.5	15.0	4.6	13.0	4,700
Los Alamos Canyon near Los Alamos	07/09	UF CS	< 0.5	29,000	22.0	220.0	3,600.0	32.6	24.1	28.0	12.0	35.0	240,000
Los Alamos Canyon near Los Alamos	07/09	UF DUP	< 0.4	28,600	22.0	215.0	3,540.0	6.7	5.2	27.6	11.4	34.9	13,300
Los Alamos Canyon near Los Alamos	07/09	F CS	< 0.5	220	5.7	93.0	110.0	0.2	0.2	3.3	1.1	6.7	407
Los Alamos Canyon near Los Alamos	10/23	F CS	0.6	617	< 2.6	13.5	17.3	0.5	< 0.1	11.3	1.1	< 1.8	368
Los Alamos Canyon near Los Alamos	10/23	UF CS	0.6	30,900	8.6	21.0	513.0	7.8	2.1	28.9	23.0	50.9	25,000
Los Alamos Canyon near Los Alamos	10/27	F CS	< 0.5	772	< 2.6	18.4	41.7	0.5	0.1	< 0.6	< 1.1	< 1.8	415
Pueblo Canyon near Los Alamos	10/23	F CS	< 0.5	2,700	4.6	91.9	99.1	0.7	0.1	1.9	0.9	4.4	1,680
Pueblo Canyon near Los Alamos	10/23	UF CS	< 0.5	90,600	29.1		2,360.0	19.4	6.0	54.5	43.8	84.7	64,900
Sandia Canyon:													
Sandia Canyon at TA-3	07/17	UF CS						0.9	1.5				12,700
Sandia Canyon at TA-3	07/17	UF CS	0.8	5,000	4.3	38.0	140.0	0.4	1.0	8.5	9.5	45.0	5,000
Mortandad Canyon (includes Ten Site Canyon, Cañada del Buey):													
TA-55	07/17	UF CS						0.3	1.6				4,120
TA-55	07/17	UF CS	0.8	1,000	< 10.0	100.0	44.0	< 5.0	0.4	6.2	2.3	84.0	1,000
TA-55	10/07	UF CS	< 0.5	1,940	< 2.6	16.2	25.3	0.6	0.3	4.6	2.0	57.5	1,310
TA-55	10/07	UF DUP	< 0.5	1,880	< 2.6	15.5	24.8	0.6	0.3	4.5	2.0	56.9	1,260
Cañada del Buey near TA-46	10/23	UF CS	0.7	19,900	3.8	16.3	147.0	5.4	2.3	3.0	14.5	25.2	13,200
Area J	08/09	UF CS	< 0.5	102,000	16.4	20.9	1,030.0	14.2	1.0	33.0	59.3	49.4	64,200
Area J	08/09	UF DUP	< 0.5	103,000	17.1	24.3	1,010.0	14.1	1.0	32.5	59.9	47.9	64,600
Area L	07/15	UF CS						0.1	1.0				1,630
Area L	07/15	UF CS	0.6	1,000	< 10.0	620.0	71.0	< 5.0	0.8	9.1	3.2	22.0	920

Table 5-16. Trace Metals in Runoff Samples for 2000 (µg/L) (Cont.)

Station Name	Date	Code[a,b]		Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe
Runoff Stations (Cont.)														
Mortandad Canyon (includes Ten Site Canyon, Cañada del Buey): (Cont.)														
Area L	07/17	F	CS						0.1	0.1				45
Area L	07/17	UF	CS						0.1	0.9				1,350
Area L	10/07	UF	CS	< 0.5	1,130	< 2.6	21.1	43.1	0.5	0.4	1.3	2.0	13.1	792
G-6	07/29	F	CS	< 0.5	18	< 2.6	73.0	51.3	0.5	0.1	1.2	< 1.1	2.4	25
G-6	07/29	UF	CS	< 0.5	59,200	13.8	82.5	509.0	8.9	1.3	16.6	36.8	46.6	38,800
G-6	08/18	F	CS	< 0.5	143	< 2.6	72.8	45.2	0.5	< 0.1	1.0	< 1.1	4.7	66
G-6	08/18	UF	CS	< 0.5	34,800	7.9	113.0	257.0	4.5	0.7	19.9	21.0	26.5	24,300
G-6	08/18	UF	DUP						2.3	0.6				
G-6	10/11	F	CS	< 0.5	531	< 2.6	24.5	23.9	0.5	< 0.1	< 0.6	< 1.1	< 1.8	301
G-6	10/11	UF	CS	< 0.5	23,400	< 2.6	55.8	339.0	6.7	0.6	7.7	16.3	21.4	15,800
G-6	10/11	UF	DUP	< 0.5	23,000	< 2.6	53.1	334.0	5.5	0.7	7.6	14.1	19.7	14,800
Cañada del Buey at White Rock	07/29	UF	CS	< 0.5	417,000	64.1	90.4	5,180.0	72.3	5.3	150.0	247.0	270.0	285,000
Cañada del Buey at White Rock	07/29	F	CS	< 0.5	232	3.0	29.1	49.0	0.5	< 0.1	2.7	< 1.1	2.4	116
Cañada del Buey at White Rock	08/18	F	CS	0.9	264	< 2.6	19.9	32.3	0.5	< 0.1	2.8	< 1.1	< 1.8	97
Cañada del Buey at White Rock	08/18	UF	CS	< 0.5	164,000	27.0	50.7	2,520.0	29.8	3.1	89.0	85.7	100.0	103,000
Cañada del Buey at White Rock	10/11	UF	CS	< 0.5	67,900	< 2.6	51.3	3,140.0	33.5	2.9	62.9	25.5	32.2	33,700
Cañada del Buey at White Rock	10/23	UF	CS	0.6	118,000	17.8	32.2	2,010.0	25.6	2.9	56.3	66.1	52.6	77,000
Cañada del Buey at White Rock	10/28	F	CS	< 0.5	4,830	< 2.6	8.3	40.7	0.7	< 0.1	< 0.6	1.9	1.9	2,510
Cañada del Buey at White Rock	10/28	UF	CS	< 0.5	21,000	3.2	19.2	1,190.0	13.8	1.7	26.0	6.3	14.3	8,010
Pajarito Canyon (includes Two-Mile, Three-Mile Canyons):														
Pajarito Canyon above Highway 501	06/28	F	CS	< 0.9	300	4.2	130.0	210.0	0.1	0.4	6.0	0.5	7.2	190
Pajarito Canyon above Highway 501	06/28	UF	TOTC	6.1	375,947	99.9	600.4	16,116.7	25.1	6.7	206.8	301.9	607.1	375,572
Pajarito Canyon above Highway 501	09/08	F	CS	< 0.5	427	4.1	27.4	80.5	0.5	< 0.1	4.2	< 1.1	3.5	444
Pajarito Canyon above Highway 501	09/08	UF	CS	< 0.5	166,000	35.9	57.0	3,890.0	15.0	5.9	71.9	88.7	135.0	103,000
Pajarito Canyon above Highway 501	09/08	UF	DUP	< 0.5	170,000	37.6	67.9	3,930.0	15.0	5.7	72.7	89.8	139.0	101,000
Pajarito Canyon above Highway 501	10/23	F	CS	0.6	100	< 2.6	23.9	67.3	0.5	< 0.1	< 0.6	< 1.1	< 1.8	136
Pajarito Canyon above Highway 501	10/23	UF	CS	0.6	13,400	4.7	32.0	433.0	1.1	0.4	8.7	6.9	11.5	9,620
Pajarito Canyon above Highway 501	10/23	UF	DUP	< 0.5	12,800	3.9	32.3	429.0	0.9	0.4	8.6	6.7	11.1	9,120
Pajarito Canyon at TA-22	06/28	F	CS	< 0.9	420	< 3.0	98.0	190.0	0.1	0.4	5.7	1.1	7.3	260
Pajarito Canyon at TA-22	06/28	UF	TOTC	12.0	70,784	48.6	274.6	2,520.1	2.7	3.6	32.1	61.9	106.4	57,392
Starmer's Gulch at TA-22	06/28	F	CS	< 0.9	280	3.8	120.0	180.0	0.1	0.4	3.0	0.4	6.6	180
Starmer's Gulch at TA-22	06/28	UF	TOTC	6.8	64,574	35.2	252.4	3,188.8	4.3	3.0	47.9	41.4	99.8	61,296
G-1	10/11	F	CS	< 0.5	859	< 2.6	13.7	12.8	0.5	< 0.1	1.1	0.7	< 1.8	470
G-1	10/11	UF	CS	< 0.5	42,200	8.9	35.8	367.0	5.5	0.4	13.1	26.2	19.8	29,200
G-2	07/29	F	CS	< 0.5	< 23	< 2.6	139.0	95.8	0.5	0.2	1.9	< 1.1	3.4	< 20
G-2	07/29	UF	CS	< 0.5	30,900	8.6	127.0	334.0	3.9	0.8	8.2	19.6	24.9	19,700
G-2	08/09	F	CS	< 0.5	51	< 2.6	49.8	40.5	0.5	< 0.1	3.0	< 1.1	2.9	30
G-2	08/09	UF	CS	< 0.5	56,400	11.7	60.0	596.0	10.4	1.3	17.6	30.7	43.7	36,600
G-2	10/11	F	CS	< 0.5	126	< 2.6	71.7	54.6	0.5	< 0.1	3.5	< 1.1	4.2	103
G-2	10/11	UF	CS	< 0.5	21,500	5.7	80.3	193.0	2.9	0.2	7.1	12.7	15.9	16,000
G-3	07/29	UF	CS	2.9	130,000	26.4	74.7	1,470.0	27.7	3.0	40.8	81.7	76.8	77,600
G-3	08/18	F	CS	< 0.5	135	< 2.6	92.3	75.0	0.5	< 0.1	3.0	1.4	3.8	37
G-3	08/18	UF	CS	< 0.5	13,700	3.5	136.0	141.0	2.2	0.3	2.3	6.2	9.9	5,700
G-3	10/11	F	CS	< 0.5	516	< 2.6	37.8	27.8	0.5	< 0.1	< 0.6	2.3	4.6	291
G-3	10/11	UF	CS	0.7	17,700	4.4	43.2	166.0	2.9	0.1	10.8	13.2	12.1	12,400
G-3	10/25	F	CS	< 0.5	195	< 2.6	21.4	25.4	0.5	0.2	< 0.6	1.2	2.3	116

Table 5-16. Trace Metals in Runoff Samples for 2000 (µg/L) (Cont.)

Station Name	Date	Code[a,b]	Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe
Runoff Stations (Cont.)													
Pajarito Canyon (includes Two-Mile, Three-Mile Canyons): (Cont.)													
G-3	10/25	UF CS	< 0.5	54,700	12.7	20.2	845.0	6.2	1.5	26.0	30.5	48.6	42,200
G-3	10/28	F CS	< 0.5	206	< 2.6	26.8	29.0	0.5	< 0.1	< 0.6	1.9	< 1.8	120
G-3	10/28	UF CS											
G-5	10/23	F CS	0.6	362	< 2.6	27.0	7.8	0.5	< 0.1	< 0.6	< 1.1	< 1.8	201
G-5	10/23	UF CS	0.6	6,940	< 2.6	22.2	46.6	0.9	< 0.1	2.2	4.3	3.6	4,590
G-4	08/15	UF CS	< 0.5	11,700	< 2.6	31.8	146.0	2.2	0.6	5.6	5.6	18.6	7,860
G-4	08/15	UF DUP	< 0.5	11,000	< 2.6	30.1	142.0	2.1	0.6	5.7	5.3	18.1	6,920
G-4	10/12	F CS	< 0.5	586	< 2.6	29.5	56.1	0.5	< 0.1	1.8	< 1.1	4.3	410
G-4	10/12	UF CS	< 0.5	4,660	3.6	32.7	83.9	0.8	0.1	4.1	2.6	8.9	2,940
Pajarito Canyon above Highway 4	06/28	F CS	< 0.9	140	8.3	190.0	310.0	0.1	0.5	3.9	0.7	6.0	130
Pajarito Canyon above Highway 4	06/28	UF CS						0.2	1.0				
Pajarito Canyon above Highway 4	06/28	UF TOTC	6.2	80,069	40.5	407.1	4,817.7	5.6	3.2	52.4	62.0	150.9	79,500
Pajarito Canyon above Highway 4	10/24	F CS	< 0.5	1,070	3.6	32.1	73.8	0.6	< 0.1	< 0.6	1.6	3.1	605
Pajarito Canyon above Highway 4	10/24	UF CS	1.7	43,300	11.2		690.0	6.0	1.7	9.4	20.0	27.7	25,900
Pajarito Canyon above Highway 4	10/27	F CS	< 0.5	323	< 2.6	39.7	76.7	0.6	0.1	< 0.6	< 1.1	1.6	192
Pajarito Canyon above Highway 4	10/27	UF CS	1.4	47,700	11.9	63.0	529.0	7.7	1.6	11.1	20.6	31.3	27,500
Water Canyon (includes Cañon del Valle, Potrillo, Fence, Indio Canyons):													
Water Canyon above Highway 501	06/28	UF TOTC	1.1	19,099	16.0	321.8	2,019.3	1.4	0.6	16.5	13.7	34.1	18,200
Water Canyon above Highway 501	10/23	F CS	0.6	3,510	4.3	29.3	80.5	0.7	< 0.1	< 0.6	1.3	3.1	1,820
Water Canyon above Highway 501	10/23	UF CS	0.6	116,000	20.4	81.5	4,880.0	37.1	1.2	79.6	50.2	56.7	63,900
Cañon del Valle above Highway 501	06/28	UF TOTC	2.6	51,898	24.4	286.7	3,827.8	3.8	1.1	38.2	39.4	86.6	58,119
Cañon del Valle above Highway 501	10/23	F CS	0.6	165	4.4	31.7	56.8	0.5	< 0.1	3.7	< 1.1	2.0	162
Cañon del Valle above Highway 501	10/23	UF CS	0.6	70,300	15.8	74.5	3,440.0	14.3	4.9	65.0	26.9	34.9	35,700
Water Canyon at Highway 4	06/28	UF TOTC	39.4	85,529	41.0	359.2	7,192.2	6.7	2.1	50.9	61.3	150.6	95,249
Water Canyon at Highway 4	10/27	F CS	< 0.5	3,700	< 2.6	34.9	134.0	0.6	0.1	1.4	< 1.1	3.7	1,820
Water Canyon at Highway 4	10/27	UF CS	3.0	142,000	24.0	105.0	5,450.0	32.4	5.9	68.0	50.5	71.9	74,200
Water Canyon at Highway 4	10/27	UF DUP	2.8	143,000	22.8	106.0	5,430.0	32.4	6.1	67.9	51.1	73.9	74,900
Indio Canyon at Highway 4	06/28	UF CS						0.2	0.5				
Water Canyon below Highway 4	06/28	F CS	< 0.9	140	8.9	130.0	550.0	0.1	0.5	3.0	0.4	6.2	110
Water Canyon below Highway 4	06/28	UF TOTC	171.1	208,933	73.6	470.6	17,368.2	15.8	5.0	121.2	144.8	370.0	234,477
Water Canyon below Highway 4	07/29	UF CS	12.0	251,000	77.0	226.0	7,520.0	43.4	11.7	108.0	130.0	290.0	173,000
Water Canyon below Highway 4	07/29	UF DUP	14.0	299,000	86.5	224.0	8,180.0	51.0	14.2	121.0	157.0	337.0	205,000
Water Canyon below Highway 4	08/12	UF CS	1.4	98,000	25.3	160.0	5,120.0	23.0	4.5	76.4	41.5	54.8	65,700
Water Canyon below Highway 4	08/18	F CS	< 0.5	424	3.3	41.2	41.8	0.5	< 0.1	1.3	< 1.1	2.0	166
Water Canyon below Highway 4	08/18	UF CS	< 0.5	17,600	3.4	27.5	292.0	1.9	0.3	4.3	8.3	12.2	9,280
Water Canyon below Highway 4	08/18	UF DUP	< 0.5	17,600	3.0	28.6	297.0	0.9		4.3	8.5	12.5	9,350
Water Canyon below Highway 4	10/23	F CS	< 0.5	862	4.0	30.6	97.2	0.5	< 0.1	2.3	< 1.1	2.5	499
Water Canyon below Highway 4	10/23	UF CS	< 0.5	54,400	13.4	69.4	5,300.0	27.0	6.1	79.5	13.7	26.2	25,400
Water Canyon below Highway 4	10/23	UF DUP	< 0.5	54,900	14.3	67.5	5,310.0	27.2	5.9	80.5	13.4	26.1	25,700
Water Canyon below Highway 4	10/27	F CS	< 0.5	1,560	< 2.6	27.8	96.1	0.5	< 0.1	< 0.6	< 1.1	1.9	816
Water Canyon below Highway 4	10/27	UF CS	3.9	96,000	22.2	80.8	4,040.0	27.8	6.1	63.0	42.9	69.9	60,800
Potrillo Canyon near White Rock	08/09	UF CS	< 0.5	99,600	17.1	22.7	1,710.0	23.4	2.8	48.8	49.9	56.5	59,300
Potrillo Canyon near White Rock	10/23	F CS	< 0.5	1,620	< 2.6	11.3	18.1	0.6	< 0.1	< 0.6	0.8	< 1.8	881
Potrillo Canyon near White Rock	10/23	UF CS	< 0.5	36,200	7.7	< 4.7	869.0	12.8	1.9	27.5	17.5	23.6	22,900

Table 5-16. Trace Metals in Runoff Samples for 2000 (µg/L) (Cont.)

Station Name	Date	Code[a,b]	Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe
Runoff Stations (Cont.)													
Ancho Canyon:													
Ancho Canyon at TA-39	08/18	UF CS	< 0.5	319,000	63.0	80.8	3,430.0	65.1	7.2	135.0	201.0	218.0	229,000
Ancho Canyon at TA-39	10/28	UF CS	< 0.5	93,500	13.5	35.9	652.0	12.4	1.2	27.3	57.7	76.6	63,500
Ancho Canyon near Bandelier NP	08/18	UF CS	< 0.5	278,000	48.9	81.5	2,250.0	41.7	6.3	86.0	162.0	165.0	185,000
Ancho Canyon near Bandelier NP	08/18	UF DUP	< 0.5	262,000	43.7	71.0	2,280.0	44.0	7.9	84.7	148.0	161.0	169,000
Ancho Canyon near Bandelier NP	10/23	UF CS	< 0.5	60,700	9.6	5.6	771.0	12.9	2.4	22.0	30.6	35.9	38,200
Ancho Canyon near Bandelier NP	10/28	UF CS	< 0.5	49,100	5.8	26.9	526.0	9.6	1.2	17.2	24.8	26.7	28,600
Runoff Grab Samples													
Upper Los Alamos Reservoir	08/31	F CS	< 0.5	2,720	3.1	52.3	227.0	0.5	< 0.1	2.3	0.9	4.0	1,660
Upper Los Alamos Reservoir	08/31	UF CS	< 0.5	73	< 2.6	24.6	61.6	0.5	< 0.1	2.6	< 1.1	2.7	283
Los Alamos Reservoir	08/31	F CS	< 0.5	19	3.2	19.4	58.9	0.5	< 0.1	2.5	< 1.1	< 1.8	186
Los Alamos Reservoir	08/31	UF CS	< 0.5	2,540	3.0	58.3	222.0	0.7	0.2	4.1	1.1	3.7	1,630
Los Alamos Reservoir	08/31	UF DUP	< 0.5	2,260	4.2	58.3	220.0	0.7	0.2	3.7	< 1.1	3.5	1,480
Los Alamos Weir	07/21	F CS	< 0.5	96	3.2	71.6	191.0	0.5	< 0.1	4.4	< 1.1	3.4	267
Los Alamos Weir	07/21	UF CS	< 0.5	39,400	10.4	80.0	856.0	5.5	1.3	14.1	16.2	41.0	19,400
Los Alamos Weir	07/21	UF DUP	< 0.5	39,800	8.9	80.7	863.0	5.5	1.4	14.2	16.6	41.6	19,900
Rendija Canyon 3rd Crossing	07/17	F CS						0.1	0.3				139
Rendija Canyon 3rd Crossing	07/17	F CS	0.9	280	12.0	75.0	77.0	< 5.0	< 5.0	9.7	0.7	2.9	160
Rendija Canyon 3rd Crossing	07/17	UF CS	0.5	24,000	44.0	2,300.0	2,000.0	13.0	5.9	56.0	5.7	7.8	3,000
Rendija Canyon 3rd Crossing	07/17	UF DUP	1.0	28,000	50.9	2,700.0	2,000.0	15.6	7.0	65.9	7.1	9.1	4,000
Guaje at SR-502	07/09	F CS	< 0.5	110	11.0	120.0	86.0	0.1	0.2	8.6	0.7	4.5	341
Guaje at SR-502	07/09	UF CS	< 0.5	7,400	24.0	290.0	1,700.0	59.4	34.0	12.0	4.3	15.0	192,900
Guaje at SR-502	09/08	F CS	< 0.5	463	6.5	46.1	108.0	0.5	< 0.1	1.9	< 1.1	4.4	273
Guaje at SR-502	09/08	UF CS	< 0.5	995,000	137.0	136.0	20,700.0	136.2	27.3	475.0	510.0	605.0	560,000
Starmer's Gulch above Highway 501	10/23	F CS	0.6	11,500	6.7	47.9	179.0	0.7	0.1	2.9	5.7	7.6	6,910
Starmer's Gulch above Highway 501	10/23	UF CS	0.6	63,700	14.2	71.0	3,840.0	16.0	4.3	65.6	22.0	26.3	32,700
Two-Mile at Highway 501	10/23	F CS	0.6	363	4.0	54.1	75.7	0.5	< 0.1	< 0.6	< 1.1	3.4	261
Two-Mile at Highway 501	10/23	UF CS	0.6	82,500	23.0	90.5	3,940.0	13.0	4.7	53.3	35.2	51.6	49,400
TA-18 Culvert	06/28	F CS	< 0.9	140	4.4	150.0	230.0	0.0	0.5	5.7	1.0	9.8	130
TA-18 Culvert	06/28	F DUP	< 0.9	138	7.3	152.0	227.0	< 0.0	< 0.2	5.7	0.8	9.5	136
TA-18 Culvert	06/28	UF TOTC	13.1	241,784	74.9	495.4	11,528.4	16.4	10.4	140.9	194.2	455.4	256,436
Pajarito Canyon at SR-4 Culvert	06/28	F CS	< 0.9	380	8.0	180.0	290.0	0.1	0.2	4.4	0.4	9.1	260
Pajarito Canyon at SR-4 Culvert	06/28	UF TOTC	16.9	252,359	90.0	480.0	10,615.3	18.0	12.9	143.9	187.5	447.0	240,696
Water Quality Standards[d]													
EPA Primary Drinking Water Standard					50		2,000	4	5	100			
EPA Secondary Drinking Water Standard				50-200									300
EPA Action Limit												1,300	
EPA Health Advisory													
NMWQCC Livestock Watering Standard				5,000	200	5,000			50	1,000	1,000	500	
NMWQCC Groundwater Limit			50	5,000	100	750			10	50	50	1,000	1,000
NMWQCC Wildlife Habitat Standard							1,000						

Table 5-16. Trace Metals in Runoff Samples for 2000 (µg/L) (Cont.)

Station Name	Date	Code[a,b]	Hg	Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn
Runoff Stations														
Los Alamos Canyon (includes Pueblo, DP Canyons):														
Los Alamos Canyon at Los Alamos	06/03	F CS	< 0.01	340.0	< 4.8	2.9	1.08	4.32	< 3.5	< 16.0	230.0	3.41	3.3	2.9
Los Alamos Canyon at Los Alamos	06/03	UF CS	< 0.01	1,500.0	< 4.8	6.8	45.80	4.53	< 3.5	< 16.0	310.0	3.62	8.7	54.0
Los Alamos Canyon at Los Alamos	07/18	F CS					0.05	1.06				0.81		
Los Alamos Canyon at Los Alamos	07/18	UF CS					319.00	1.55				3.71		
Los Alamos Canyon at Los Alamos	07/18	UF DUP					409.00	1.35				3.86		
Los Alamos Canyon at Los Alamos	07/18	F CS	< 0.20	1,000.0	7.2	6.0	< 3.00	20.00	< 5.0	< 50.0	320.0	< 10.00	4.7	10.0
Los Alamos Canyon at Los Alamos	07/18	UF CS	0.02	20,000.0	< 10.0	40.0	54.00	< 20.00	9.3	< 50.0	1,000.0	< 20.00	40.0	480.0
Los Alamos Canyon at Los Alamos	09/12	F CS		1,670.0	2.5	4.8	1.09	0.68		< 2.0	329.0	0.24	2.1	4.5
Los Alamos Canyon at Los Alamos	09/12	UF CS	< 0.06	2,160.0	1.8	9.4	14.80	0.69	< 2.4	< 2.0	361.0	0.24	8.8	35.6
Los Alamos Canyon below TA- 2	06/02	UF CS	< 0.01	2,500.0	< 4.8	19.0	381.00	3.93	< 3.5	< 16.0	190.0	4.08	33.0	430.0
Los Alamos Canyon below TA- 2	10/23	UF CS		215.0	< 1.1	3.8	8.21	0.22	< 2.4	< 2.0	131.0	0.03	7.0	64.2
DP Canyon below Meadow at TA-21	07/25	F CS		5.3	1.7	1.4	0.48	< 0.68	< 2.4	< 3.1	46.8	< 0.01	3.3	48.6
DP Canyon below Meadow at TA-21	07/25	UF CS	< 0.06	188.0	1.8	5.4	29.70	1.12	< 2.4	< 3.1	56.4	0.05	10.5	200.0
DP Canyon below Meadow at TA-21	10/23	UF CS		652.0	< 1.1	15.8	81.50	1.29	< 2.4	3.0	79.2	0.17	28.7	508.0
DP Canyon below Meadow at TA-21	10/27	F CS		5.0	< 1.1	< 3.1	0.89	0.42		< 2.0	24.5	0.11	2.3	17.9
DP Canyon below Meadow at TA-21	10/27	F DUP		5.2	< 1.1	< 3.1	0.90	0.36		< 2.0	24.3	< 0.01	2.0	17.7
DP Canyon below Meadow at TA-21	10/27	UF CS		779.0	< 1.1	14.3	101.00	1.12		2.4	81.1	0.17	29.7	546.0
DP Canyon at Mouth	06/02	UF CS	< 0.01	1,900.0	< 4.8	18.0	395.00	4.43	< 3.5	< 16.0	150.0	3.88	33.0	620.0
DP Canyon at Mouth	10/23	UF CS		1,240.0	< 1.1	22.8	123.00	1.71	< 2.4	< 2.0	110.0	0.19	44.6	554.0
DP Canyon at Mouth	10/27	F CS		9.1	< 1.1	< 3.1	1.50	0.54		2.7	34.8	< 0.01	2.3	19.9
DP Canyon at Mouth	10/27	UF CS		2,610.0	2.8	39.1	246.00	1.40	3.4	2.4	188.0	0.42	75.1	1,070.0
Los Alamos Canyon near Los Alamos	06/02	UF CS	< 0.01	4,100.0	< 4.8	33.0	591.00	4.53	< 3.5	< 16.0	300.0	4.51	55.0	850.0
Los Alamos Canyon near Los Alamos	06/03	F CS	< 0.01	390.0	6.7	3.0	1.03	4.38	< 3.5	< 16.0	240.0	3.41	3.0	4.6
Los Alamos Canyon near Los Alamos	06/03	UF CS	< 0.01	4,800.0	< 4.8	18.0	164.00	4.35	4.3	< 16.0	480.0	3.94	21.0	210.0
Los Alamos Canyon near Los Alamos	07/09	UF CS	< 0.01	25,000.0	5.4	31.0	1,110.00	6.21	12.0	< 20.0	1,700.0	20.42	40.0	810.0
Los Alamos Canyon near Los Alamos	07/09	UF DUP	< 0.01	24,600.0	< 4.2	30.4	101.00	< 2.79	12.2	< 20.4	1,650.0	< 11.00	40.0	811.0
Los Alamos Canyon near Los Alamos	07/09	F CS	< 0.01	390.0	9.4	4.2	2.45	4.05	< 2.6	< 20.0	190.0	3.77	4.7	7.6
Los Alamos Canyon near Los Alamos	10/23	F CS		8.8	< 1.1	3.2	0.68	0.41		2.4	33.9	0.02	1.9	4.8
Los Alamos Canyon near Los Alamos	10/23	UF CS	< 0.06	3,010.0	< 1.1	28.2	124.00	0.76	< 2.4	2.4	144.0	0.22	43.7	470.0
Los Alamos Canyon near Los Alamos	10/27	F CS		38.1	5.4	1.3	1.15	0.85		2.4	81.6	< 0.01	1.8	12.3
Pueblo Canyon near Los Alamos	10/23	F CS		1,360.0	3.3	3.4	4.05	3.62		< 2.0	145.0	< 0.01	6.7	164.0
Pueblo Canyon near Los Alamos	10/23	UF CS	0.25	14,900.0	2.6	76.8	216.00	0.60	4.0	< 2.0	643.0	0.76	132.0	692.0
Sandia Canyon:														
Sandia Canyon at TA-3	07/17	UF CS					46.80	1.44				0.40		
Sandia Canyon at TA-3	07/17	UF CS	0.08	390.0	< 10.0	9.7	43.00	2.90	< 5.0	< 50.0	55.0	< 10.00	13.0	500.0
Mortandad Canyon (includes Ten Site Canyon, Cañada del Buey):														
TA-55	07/17	UF CS					12.70	< 0.11				0.35		
TA-55	07/17	UF CS	0.03	120.0	< 10.0	4.6	8.30	< 20.00	< 5.0	< 50.0	28.0	< 10.00	6.6	240.0
TA-55	10/07	UF CS	< 0.06	62.0	2.0	2.5	4.06	0.26	< 2.4		17.9	0.46	3.9	201.0
TA-55	10/07	UF DUP		60.5	< 1.1	2.2	4.19	< 0.11	< 2.4		17.5	0.13	3.8	198.0
Cañada del Buey near TA-46	10/23	UF CS		328.0	< 1.1	11.9	93.20	0.46	< 2.4	< 2.0	72.9	0.47	22.2	358.0
Area J	08/09	UF CS	< 0.06	1,880.0	2.1	50.4	70.30	< 0.68	5.8	3.2	201.0	1.23	132.0	392.0
Area J	08/09	UF DUP	< 0.06	1,880.0	1.5	49.6	74.30	< 0.11	3.0	< 2.0	198.0	0.91	135.0	386.0
Area L	07/15	UF CS					3.93	4.84				0.24		
Area L	07/15	UF CS	0.06	180.0	< 10.0	5.9	3.30	5.00	< 5.0	< 50.0	59.0	< 10.00	6.4	320.0

Table 5-16. Trace Metals in Runoff Samples for 2000 (µg/L) (Cont.)

Station Name	Date	Code[a,b]	Hg	Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn
Runoff Stations (Cont.)														
Mortandad Canyon (includes Ten Site Canyon, Cañada del Buey): (Cont.)														
Area L	07/17	F CS					0.22	2.59				0.26		
Area L	07/17	UF CS					3.34	10.90				0.24		
Area L	10/07	UF CS	< 0.06	60.6	< 1.1	1.9	2.01	1.10	< 2.4		25.4	0.32	3.0	249.0
G-6	07/29	F CS		51.1	< 1.5	< 3.1	0.05	3.39	< 2.4	< 3.1	155.0	< 0.01	3.1	< 2.2
G-6	07/29	UF CS	< 0.06	1,390.0	2.4	32.3	45.70	1.70	< 2.4	< 3.1	283.0	0.53	75.0	364.0
G-6	08/18	F CS		27.6	< 1.1	< 3.1	< 0.08	8.61		< 2.0	103.0	0.34	2.9	2.7
G-6	08/18	UF CS	< 0.06	676.0	3.8	18.1	20.10	6.41	4.0	3.7	158.0	0.48	41.5	204.0
G-6	08/18	UF DUP					20.50	6.04				0.20		
G-6	10/11	F CS		12.5	< 1.1	1.0	0.18	5.34	< 2.4	< 2.0	46.5	< 0.01	2.3	6.6
G-6	10/11	UF CS	< 0.06	907.0	< 1.1	14.9	24.60	4.02	< 2.4	< 2.0	126.0	0.27	34.2	188.0
G-6	10/11	UF DUP		879.0	< 1.1	14.5	24.60	3.71	< 2.4	< 2.0	124.0	< 0.01	32.2	185.0
Cañada del Buey at White Rock	07/29	UF CS	< 0.06	9,200.0	2.0	259.0	305.00	< 3.41	< 2.4	6.2	991.0	5.43	452.0	983.0
Cañada del Buey at White Rock	07/29	F CS		228.0	< 1.5	1.6	0.26	< 0.68	< 2.4	< 3.1	79.2	< 0.01	7.7	< 2.2
Cañada del Buey at White Rock	08/18	F CS		7.7	< 1.1	< 3.1	0.02	< 0.11		< 2.0	43.4	< 0.01	5.4	< 3.9
Cañada del Buey at White Rock	08/18	UF CS	< 0.06	5,660.0	2.2	106.0	206.00	< 0.11	7.8	5.2	450.0	2.69	201.0	348.0
Cañada del Buey at White Rock	10/11	UF CS	< 0.06	5,940.0	< 1.1	85.4	43.50	0.41	< 2.4	< 2.0	659.0	0.53	76.2	188.0
Cañada del Buey at White Rock	10/23	UF CS	< 0.06	4,410.0	< 1.1	86.1	62.70	0.30	3.2	2.4	380.0	0.44	133.0	213.0
Cañada del Buey at White Rock	10/28	F CS		32.9	< 1.1	2.0	1.65	0.59		2.4	32.3	< 0.01	6.6	9.9
Cañada del Buey at White Rock	10/28	UF CS		2,190.0	< 1.1	31.2	20.60	0.17	4.4	2.4	227.0	0.44	32.4	51.5
Pajarito Canyon (includes Two-Mile, Three-Mile Canyons):														
Pajarito Canyon above Highway 501	06/28	F CS	< 0.01	450.0	5.9	3.6	1.41	5.73	4.1	< 16.0	420.0	3.56	3.9	6.1
Pajarito Canyon above Highway 501	06/28	UF TOTC	1.33	53,277.8	39.7	255.1	851.87	25.08	41.7	290.8	6,944.4	26.36	654.2	1,883.5
Pajarito Canyon above Highway 501	09/08	F CS		307.0	< 1.1	2.1	0.33	0.68		< 2.0	150.0	0.03	2.7	5.7
Pajarito Canyon above Highway 501	09/08	UF CS	< 0.06	19,000.0	2.2	92.4	227.00	1.37	< 2.4	4.6	953.0	1.48	189.0	557.0
Pajarito Canyon above Highway 501	09/08	UF DUP		19,000.0	2.9	93.3	248.00	< 0.11	< 2.4	< 2.0	955.0	1.17	185.0	564.0
Pajarito Canyon above Highway 501	10/23	F CS		90.0	< 1.1	< 3.1	< 0.08	< 0.11		2.4	149.0	0.02	1.8	0.5
Pajarito Canyon above Highway 501	10/23	UF CS	0.26	2,150.0	< 1.1	8.7	21.40	0.20	< 2.4	2.4	228.0	0.02	17.0	49.8
Pajarito Canyon above Highway 501	10/23	UF DUP		2,140.0	< 1.1	8.6	21.80	< 0.11	< 2.4	< 2.0	226.0	0.03	16.5	54.1
Pajarito Canyon at TA-22	06/28	F CS	< 0.01	320.0	8.2	3.9	1.46	4.86	< 3.5	< 16.0	360.0	3.57	4.2	9.0
Pajarito Canyon at TA-22	06/28	UF TOTC	0.45	5,984.9	82.8	76.4	157.55	47.70	50.3	562.0	1,022.1	47.60	105.1	491.7
Starmer's Gulch at TA-22	06/28	F CS	< 0.01	530.0	7.5	6.0	2.22	5.76	< 3.5	< 16.0	340.0	3.58	1.7	11.0
Starmer's Gulch at TA-22	06/28	UF TOTC	0.18	14,186.6	24.9	56.3	135.89	15.74	22.3	143.1	1,524.7	17.23	101.7	588.1
G-1	10/11	F CS		8.4	< 1.1	1.4	0.25	0.39	< 2.4	< 2.0	15.1	< 0.01	2.3	3.1
G-1	10/11	UF CS	< 0.06	858.0	< 1.1	19.1	35.80	0.32	< 2.4	< 2.0	88.9	0.14	51.3	122.0
G-2	07/29	F CS		83.9	< 1.5	< 3.1	0.02	< 0.68	2.9	< 3.1	379.0	< 0.01	3.1	< 2.2
G-2	07/29	UF CS	< 0.06	867.0	1.5	16.4	24.80	< 0.68	< 2.4	< 3.1	431.0	0.26	42.8	211.0
G-2	08/09	F CS		24.4	< 1.1	< 3.1	< 0.08	< 0.68		3.5	108.0	0.12	4.1	< 3.9
G-2	08/09	UF CS	< 0.06	1,790.0	3.4	29.6	52.30	0.69	< 2.4	7.2	253.0	0.77	75.0	379.0
G-2	10/11	F CS		25.2	< 1.1	1.5	< 0.08	1.74	< 2.4	< 2.0	160.0	< 0.01	2.4	3.5
G-2	10/11	UF CS	< 0.06	437.0	< 1.1	12.0	12.10	0.98	< 2.4	< 2.0	195.0	< 0.02	27.3	115.0
G-3	07/29	UF CS	< 0.06	3,700.0	5.2	68.1	142.00	< 0.68	< 2.4	3.9	465.0	1.21	149.0	570.0
G-3	08/18	F CS		25.6	5.4	< 3.1	< 0.08	< 0.11		< 2.0	182.0	< 0.01	5.4	< 3.9
G-3	08/18	UF CS	< 0.06	207.0	2.5	4.8	9.33	1.00	< 2.4	< 2.0	214.0	< 0.01	15.4	44.1
G-3	10/11	F CS		21.0	4.0	1.3	0.11	1.36	< 2.4	< 2.0	57.5	< 0.01	5.5	7.3
G-3	10/11	UF CS	< 0.06	349.0	3.9	10.0	13.20	0.78	< 2.4	< 2.0	88.8	< 0.02	23.5	149.0
G-3	10/25	F CS		28.4	< 1.1	2.4	0.30	0.52		< 2.0	44.4	< 0.01	2.7	149.0

Table 5-16. Trace Metals in Runoff Samples for 2000 (µg/L) (Cont.)

Station Name	Date	Code[a,b]		Hg	Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn
Runoff Stations (Cont.)															
Pajarito Canyon (includes Two-Mile, Three-Mile Canyons): (Cont.)															
G-3	10/25	UF	CS		3,080.0	4.1	36.7	13.60	0.52	3.9	< 2.0	200.0	0.07	77.0	322.0
G-3	10/28	F	CS		15.9	3.8	< 3.1	0.20	0.52		2.4	47.8	< 0.01	2.9	9.1
G-3	10/28	UF	CS	< 0.06											
G-5	10/23	F	CS		15.5	< 1.1	< 3.1	0.10	< 0.11		2.4	10.5	0.02	1.0	12.4
G-5	10/23	UF	CS	< 0.06	160.0	< 1.1	3.8	6.32	< 0.11	3.2	2.4	19.4	0.02	7.2	36.9
G-4	08/15	UF	CS	< 0.06	355.0	4.1	5.8	11.10	2.00	2.9	< 2.0	71.1	0.39	15.2	125.0
G-4	08/15	UF	DUP		336.0	1.5	5.9	10.80	1.99	2.4	< 2.0	69.7	0.20	14.4	122.0
G-4	10/12	F	CS		15.9	< 1.1	2.3	0.32	1.90	< 2.4	< 2.0	89.7	< 0.01	2.7	23.9
G-4	10/12	UF	CS	< 0.06	71.2	< 1.1	4.3	3.39	1.96	< 2.4	< 2.0	95.2	< 0.02	6.7	61.6
Pajarito Canyon above Highway 4	06/28	F	CS	< 0.01	1,100.0	14.0	9.6	1.21	8.15	< 3.5	< 16.0	590.0	5.04	4.2	8.1
Pajarito Canyon above Highway 4	06/28	UF	CS					3.34	3.06				0.26		
Pajarito Canyon above Highway 4	06/28	UF	TOTC	0.20	28,652.0	18.0	89.0	209.30	8.54	17.5	73.6	3,823.6	14.07	125.7	540.9
Pajarito Canyon above Highway 4	10/24	F	CS		112.0	< 1.1	2.7	1.03	0.45		< 2.0	152.0	< 0.01	3.9	141.0
Pajarito Canyon above Highway 4	10/24	UF	CS	< 0.06	2,020.0	< 1.1	22.6	55.00	0.48	4.2	< 2.0	271.0	0.42	40.6	163.0
Pajarito Canyon above Highway 4	10/27	F	CS		15.7	2.1	1.8	0.44	0.67		2.4	162.0	< 0.01	2.2	4.5
Pajarito Canyon above Highway 4	10/27	UF	CS	< 0.06	1,540.0	2.9	20.0	65.10	0.62	< 2.4	2.4	237.0	0.56	41.4	184.0
Water Canyon (includes Cañon del Valle, Potrillo, Fence, Indio Canyons):															
Water Canyon above Highway 501	06/28	UF	TOTC	0.05	16,991.7	6.4	20.2	53.90	5.60	8.3	29.0	2,908.4	7.44	30.7	155.0
Water Canyon above Highway 501	10/23	F	CS		168.0	< 1.1	2.1	1.72	0.47		2.4	124.0	0.02	4.7	7.5
Water Canyon above Highway 501	10/23	UF	CS	< 0.06	26,600.0	2.0	73.8	21.40	< 0.11	3.1	2.4	1,510.0	0.49	114.0	696.0
Cañon del Valle above Highway 501	06/28	UF	TOTC	0.21	31,369.0	11.6	43.0	135.50	6.52	20.1	56.8	3,311.7	12.91	84.4	374.2
Cañon del Valle above Highway 501	10/23	F	CS		73.2	< 1.1	1.7	< 0.08	< 0.11		2.4	123.0	0.02	1.2	4.6
Cañon del Valle above Highway 501	10/23	UF	CS	< 0.06	17,900.0	< 1.1	50.0	86.40	0.52	< 2.4	2.4	955.0	0.85	73.3	506.0
Water Canyon at Highway 4	06/28	UF	TOTC	0.45	22,469.4	17.3	70.6	238.89	8.19	19.9	66.0	3,541.9	11.23	137.6	522.9
Water Canyon at Highway 4	10/27	F	CS		448.0	3.2	2.1	3.18	0.81		2.4	166.0	0.06	5.4	12.0
Water Canyon at Highway 4	10/27	UF	CS		21,400.0	3.4	62.9	121.00	0.59	17.3	2.4	1,860.0	1.46	135.0	600.0
Water Canyon at Highway 4	10/27	UF	DUP		21,400.0	2.9	65.0	126.00	0.52	17.4	< 2.0	1,850.0	1.18	136.0	599.0
Indio Canyon at Highway 4	06/28	UF	CS					3.92	2.81				0.25		
Water Canyon below Highway 4	06/28	F	CS	0.01	670.0	12.0	6.0	1.56	5.62	< 3.5	< 16.0	470.0	3.56	1.9	7.5
Water Canyon below Highway 4	06/28	UF	TOTC	1.06	45,170.0	25.3	175.7	599.89	17.71	45.0	197.9	5,134.0	18.61	341.3	1,316.8
Water Canyon below Highway 4	07/29	UF	CS	< 0.06	24,500.0	5.9	152.0	471.00	< 3.41	23.3	9.3	1,860.0	4.62	266.0	1,520.0
Water Canyon below Highway 4	07/29	UF	DUP		26,900.0	6.8	179.0	612.00	< 0.11	< 2.4	11.2	1,910.0	3.33	308.0	1,710.0
Water Canyon below Highway 4	08/12	UF	CS	< 0.06	29,800.0	5.1	55.7	113.00	< 0.11	7.8	3.7	1,900.0	1.59	111.0	634.0
Water Canyon below Highway 4	08/18	F	CS		26.5	2.1	< 3.1	0.04	< 0.11		< 2.0	79.0	< 0.01	3.9	< 3.9
Water Canyon below Highway 4	08/18	UF	CS	0.09	754.0	1.7	7.0	19.00	< 0.11	< 2.4	< 2.0	132.0	0.08	17.9	49.8
Water Canyon below Highway 4	08/18	UF	DUP		771.0	< 1.1	7.5			< 2.4	< 2.0	134.0		18.1	51.2
Water Canyon below Highway 4	10/23	F	CS		205.0	< 1.1	1.7	0.45	2.44		< 2.0	165.0	0.04	5.1	25.3
Water Canyon below Highway 4	10/23	UF	CS	< 0.06	30,600.0	< 1.1	51.9	72.20	0.81	< 2.4	< 2.0	1,650.0	1.15	79.4	589.0
Water Canyon below Highway 4	10/23	UF	DUP		29,900.0	< 1.1	52.1	74.60	0.47	< 2.4	< 2.0	1,660.0	0.64	79.9	591.0
Water Canyon below Highway 4	10/27	F	CS		44.4	2.0	1.6	1.08	0.54		2.4	93.0	< 0.01	2.7	6.0
Water Canyon below Highway 4	10/27	UF	CS	< 0.06	12,100.0	2.5	59.9	144.00	0.77	11.1	2.4	799.0	1.07	110.0	556.0
Potrillo Canyon near White Rock	08/09	UF	CS	< 0.06	4,170.0	1.5	62.2	106.00	< 0.68	2.3	< 3.1	334.0	1.17	127.0	247.0
Potrillo Canyon near White Rock	10/23	F	CS		13.9	< 1.1	1.3	0.85	0.69		< 2.0	15.0	0.02	2.6	13.3
Potrillo Canyon near White Rock	10/23	UF	CS	< 0.06	2,680.0	< 1.1	33.4	44.50	0.86	3.5	< 2.0	176.0	0.29	50.6	151.0

Table 5-16. Trace Metals in Runoff Samples for 2000 (μg/L) (Cont.)

Station Name	Date	Code[a,b]		Hg	Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn
Runoff Stations (Cont.)															
Ancho Canyon:															
Ancho Canyon at TA-39	08/18	UF	CS	< 0.06	7,360.0	2.6	233.0	356.00	< 3.41	5.2	12.1	788.0	5.72	360.0	922.0
Ancho Canyon at TA-39	10/28	UF	CS		1,440.0	1.5	49.9	75.10	0.40	4.2	2.4	155.0	0.92	96.9	262.0
Ancho Canyon near Bandelier NP	08/18	UF	CS	0.11	4,810.0	2.6	156.0	240.00	< 3.41	6.2	7.9	505.0	5.37	249.0	716.0
Ancho Canyon near Bandelier NP	08/18	UF	DUP		4,830.0	1.7	151.0	261.00	< 0.11	5.0	7.2	513.0	3.27	227.0	674.0
Ancho Canyon near Bandelier NP	10/23	UF	CS	< 0.06	1,800.0	< 1.1	37.9	62.40	0.46	< 2.4	< 2.0	187.0	0.61	63.7	181.0
Ancho Canyon near Bandelier NP	10/28	UF	CS		1,110.0	< 1.1	26.1	46.10	0.29	< 2.4	2.4	125.0	0.47	48.4	106.0
Runoff Grab Samples															
Upper Los Alamos Reservoir	08/31	F	CS		2,000.0	2.5	5.5	< 0.08	< 0.11		< 2.0	385.0	< 0.03	4.2	10.3
Upper Los Alamos Reservoir	08/31	UF	CS	0.05	701.0	3.3	2.6	0.09	< 0.11	< 2.4	< 2.0	183.0	0.39	1.6	2.9
Los Alamos Reservoir	08/31	F	CS		676.0	2.4	1.8	0.50	< 0.11		< 2.0	179.0	0.05	1.6	2.2
Los Alamos Reservoir	08/31	UF	CS	0.05	2,010.0	3.5	5.9	4.42	< 0.11	< 2.4	< 2.0	378.0	0.27	4.5	19.2
Los Alamos Reservoir	08/31	UF	DUP		1,980.0	2.5	5.7	4.20	< 0.11	2.2	< 2.0	377.0	< 0.01	4.2	10.1
Los Alamos Weir	07/21	F	CS		1,870.0	10.9	5.1	0.37	1.09	< 2.4	< 2.0	416.0	0.36	3.4	4.5
Los Alamos Weir	07/21	UF	CS	0.07	3,900.0	9.2	30.4	58.30	0.78	< 2.4	< 2.0	598.0	0.87	33.2	171.0
Los Alamos Weir	07/21	UF	DUP	0.06	3,940.0	7.9	29.9	58.10	0.74	< 2.4	< 2.0	602.0	0.84	33.7	165.0
Rendija Canyon 3rd Crossing	07/17	F	CS					0.72	10.70				0.34		
Rendija Canyon 3rd Crossing	07/17	F	CS	< 0.20	480.0	< 10.0	5.0	< 3.00	280.00	< 5.0	< 50.0	160.0	< 10.00	3.7	6.8
Rendija Canyon 3rd Crossing	07/17	UF	CS	< 0.20	16,000.0	< 10.0	39.0	160.00	21.00	10.0	< 50.0	1,000.0	< 7.30	35.0	560.0
Rendija Canyon 3rd Crossing	07/17	UF	DUP	< 0.20	19,000.0	< 4.2	45.8	191.00	25.50	10.3	< 20.4	1,000.0	< 7.32	41.6	659.0
Guaje at SR-502	07/09	F	CS	< 0.01	530.0	13.0	6.9	2.34	5.61	< 2.6	< 20.0	210.0	3.71	3.8	5.3
Guaje at SR-502	07/09	UF	CS	< 0.01	17,000.0	5.8	14.0	1,209.00	6.21	8.8	< 20.0	2,400.0	11.24	13.0	93.0
Guaje at SR-502	09/08	F	CS		765.0	5.1	2.9	0.36	0.68		< 2.0	212.0	0.03	2.1	3.2
Guaje at SR-502	09/08	UF	CS	< 0.06	102,000.0	5.3	826.0	91.50	1.37	< 2.4	12.7	4,780.0	4.24	536.0	3,610.0
Starmer's Gulch above Highway 501	10/23	F	CS		576.0	< 1.1	5.9	6.99	0.21		2.4	134.0	0.02	12.2	37.3
Starmer's Gulch above Highway 501	10/23	UF	CS	< 0.06	22,800.0	< 1.1	44.6	64.90	0.26	< 2.4	2.4	1,030.0	0.29	66.4	454.0
Two-Mile at Highway 501	10/23	F	CS		269.0	< 1.1	1.2	0.15	0.20		2.4	124.0	0.02	1.5	0.6
Two-Mile at Highway 501	10/23	UF	CS	< 0.06	18,800.0	< 1.1	50.2	124.00	0.39	< 2.4	2.4	1,140.0	0.81	83.3	538.0
TA-18 Culvert	06/28	F	CS	< 0.01	670.0	13.0	10.0	1.45	5.93	3.9	< 16.0	490.0	3.55	2.9	4.7
TA-18 Culvert	06/28	F	DUP	< 0.01	659.0	12.0	8.9	< 0.95	< 3.48	< 3.5	< 15.7	491.0	< 3.37	2.5	5.0
TA-18 Culvert	06/28	UF	TOTC	1.19	47,248.9	27.4	240.8	689.88	25.16	56.7	223.9	4,916.0	20.24	408.1	1,574.9
Pajarito Canyon at SR-4 Culvert	06/28	F	CS	< 0.01	930.0	16.0	10.0	3.54	6.35	3.8	< 16.0	590.0	3.41	3.6	9.1
Pajarito Canyon at SR-4 Culvert	06/28	UF	TOTC	0.38	43,163.5	30.3	245.8	629.89	14.32	48.3	168.1	4,501.1	20.23	385.0	1,592.9
Water Quality Standards[d]															
EPA Primary Drinking Water Standard				2			100		6	50					
EPA Secondary Drinking Water Standard					50										5,000
EPA Action Limit								15							
EPA Health Advisory												25,000-90,000		80-110	
NMWQCC Livestock Watering Standard				10				100		50					25,000
NMWQCC Groundwater Limit				2	200	1,000	200	50		50					10,000
NMWQCC Wildlife Habitat Standard				0.77						5					

[a] Codes: UF–Unfiltered; F–Filtered.
[b] Sample Type: CS–Customer Sample; DUP–Laboratory Duplicate; TOTC–Total Concentration Calculated from Laboratory Data.
[c] Less than symbol (<) means measurement was below the specified limit of detection of the analytical method.
[d] Standards given here for comparison only; see Appendix A. Note that New Mexico Livestock Watering and Groundwater Limits are based on dissolved concentrations, whereas many of these analyses are of unfiltered samples; thus, concentration may include suspended sediment quantities.

Table 5-17. Calculated Metals Concentrations and Uncertainties for Suspended Sediments in Runoff Samples (mg/kg unless otherwise noted)[a]

Station Name	Date	Analyte	TSS (mg/L)	Metal Concentration	Uncertainty	Screening Level[b]	Ratio Concentration/ Screening Level
Pajarito Canyon above Highway 4	06/28	Mn	2,400	11,480	1,718	3,200	3.6
Water Canyon below Highway 4	06/28	Mn	5,800	7,672	1,099	3,200	2.4
Pajarito Canyon at Highway 4 Culvert	06/28	Mn	5,700	7,409	1,072	3,200	2.3
Cañon de Valle above Highway 501	10/23	Mn	2,840	6,277	890	3,200	2.0
Starmers Gulch at TA-22	06/28	Mn	3,100	4,405	658	3,200	1.4
Starmers Gulch above Highway 501	10/23	Mn	6,240	3,562	519	3,200	1.1
Water Canyon below Highway 4	06/28	Mn	13,000	3,423	490	3,200	1.1
Cañon de Valle above Highway 501	10/23	Mn	5,350	3,332	472	3,200	1.0

[a]Table shows metals found at levels greater than EPA soil screening levels. Samples with TSS concentrations less than 1000 mg/L not included because of larger uncertainty in the calculated concentrations.
[b]EPA Region 6 Human Health Medium-Specific Screening Levels for residential exposures.

Table 5-18. Organic Chemicals Detected in Runoff Samples in 2000 (μg/L)

Station Name	Date	Field Prep[a]	Lab Sample[a]	Suite[b]	Analyte	Result	MDL	Lab Qual[c]	Lab Code[d]
Pajarito Canyon above Highway 501	06/28	UF	CS	HEXP	2,4,6-Trinitrotoluene	0.44	0.035	X	PARA
Indio Canyon at Highway 4	06/28	UF	CS	HEXP	2,4,6-Trinitrotoluene	0.38	0.035	X	PARA
Cañon del Valle above Highway 501	06/28	UF	CS	HEXP	4-Amino-2,6-dinitrotoluene	1.3	0.08	X	PARA
Water Canyon below Highway 4	06/28	UF	CS	HEXP	4-Amino-2,6-dinitrotoluene	1.3	0.08	X	PARA
Pajarito Canyon at SR-4 Culvert	06/28	UF	CS	HEXP	4-Amino-2,6-dinitrotoluene	1.9	0.08	X	PARA
Indio Canyon at Highway 4	06/28	UF	CS	HEXP	4-Amino-2,6-dinitrotoluene	1.2	0.08	X	PARA
Pajarito Canyon above Highway 501	06/28	UF	CS	HEXP	4-Amino-2,6-dinitrotoluene	2.8	0.08	X	PARA
Indio Canyon at Highway 4	06/28	UF	CS	HEXP	HMX	2.2	0.041		PARA
Indio Canyon at Highway 4	06/28	UF	RE	HEXP	HMX	2.2	0.041		PARA
Cañon del Valle above Highway 501	06/28	UF	CS	HEXP	2-Amino-4,6-dinitrotoluene	1	0.061	X	PARA
Pajarito Canyon above Highway 501	06/28	UF	CS	HEXP	2-Amino-4,6-dinitrotoluene	1.3	0.061	X	PARA
Cañon del Valle above Highway 501	06/28	UF	CS	HEXP	Tetryl	8.1	0.076	X	PARA
Indio Canyon at Highway 4	06/28	UF	CS	HEXP	Tetryl	3.7	0.076	X	PARA
Pajarito Canyon at SR-4 Culvert	06/28	UF	CS	HEXP	Tetryl	18	0.076	X	PARA
Cañon del Valle above Highway 501	06/28	UF	CS	HEXP	2-nitrotoluene	1.4	0.069	X	PARA
Canon del Valle above Highway 501	06/28	UF	CS	HEXP	Nitrobenzene	5.6	0.04	X	PARA
Pajarito Canyon above Highway 501	06/28	UF	CS	HEXP	Nitrobenzene	13	0.04	X	PARA
Indio Canyon at Highway 4	06/28	UF	CS	HEXP	Nitrobenzene	4	0.04	X	PARA
Water Canyon below Highway 4	06/28	UF	CS	HEXP	3-Nitrotoluene	2.7	0.031	X	PARA
Pajarito Canyon at SR-4 Culvert	06/28	UF	CS	HEXP	3-Nitrotoluene	3	0.031	X	PARA
Pajarito Canyon above Highway 4	06/28	UF	CS	HEXP	1,3,5-trinitrobenzene	2.6	0.049	X	PARA
Pajarito Canyon at SR-4 Culvert	06/28	UF	CS	HEXP	1,3,5-trinitrobenzene	4.2	0.049	X	PARA
Water Canyon below Highway 4	06/28	UF	CS	HEXP	1,3,5-trinitrobenzene	5.7	0.049	X	PARA
Water Canyon below Highway 4	06/28	UF	CS	HEXP	1,3-Dinitrobenzene	1.9	0.078	X	PARA
Guaje Canyon at SR-502	07/09	UF	CS	HEXP	1,3,5-trinitrobenzene	1.5	0.049	X	PARA
Water Canyon at Highway 4	10/27	UF	CS	HEXP	RDX	0.76	0.0221		GELC
Water Canyon at Highway 4	10/27	UF	CS	HEXP	HMX	0.52	0.0261		GELC
Los Alamos Canyon at Los Alamos	06/03	UF	CS	SVOA	Benzoic Acid	690	40		PARA
Los Alamos Canyon at Los Alamos	06/03	UF	CS	SVOA	Benzoic Acid	250	16		PARA
Pajarito Canyon at TA-18 Culvert	06/28	UF	CS	SVOA	Benzoic Acid	1,900	120		PARA
Pajarito Canyon above Highway 501	06/28	UF	CS	SVOA	Benzoic Acid	1,800	84		PARA
Starmers Gulch at TA-22	06/28	UF	CS	SVOA	Benzoic Acid	1,300	82		PARA
Pajarito Canyon above Highway 4	06/28	UF	CS	SVOA	Benzoic Acid	1,300	95		PARA

Table 5-18. Organic Chemicals Detected in Runoff Samples in 2000 (µg/L) (Cont.)

Station Name	Date	Field Prep[a]	Lab Sample[a]	Suite[b]	Analyte	Result	MDL	Lab Qual[c]	Lab Code[d]
Guaje Canyon at SR-502	07/09	UF	CS	SVOA	Pyridine	16	3		PARA
Los Alamos Canyon near Los Alamos	07/09	UF	CS	SVOA	Bis(2-ethylhexyl)phthalate	1.9	1.1		PARA
Guaje Canyon at SR-502	07/09	UF	CS	SVOA	Benzoic Acid	67	5.2		PARA
Los Alamos Canyon at Los Alamos	09/12	UF	CS	SVOA	Bis(2-ethylhexyl)phthalate	1.4	0.32		GELC
G-4	10/12	UF	CS	SVOA	Bis(2-ethylhexyl)phthalate	5.3	0.32		GELC
G-4	10/12	UF	CS	SVOA	Bis(2-ethylhexyl)phthalate	13.1	0.32		GELC
G-4	10/12	UF	CS	SVOA	2-Methylnaphthalene	3.6	0.15		GELC
Starmer’s Gulch above Highway 501	10/23	UF	CS	SVOA	Benzyl Alcohol	31.6	0.23		GELC
Starmer’s Gulch above Highway 501	10/23	UF	CS	SVOA	Benzoic Acid	111	2.76		GELC
Water Canyon above Highway 501	10/23	UF	CS	SVOA	Benzoic Acid	43.8	2.76		GELC
Cañon del Valle above Highway 501	10/23	UF	CS	SVOA	Benzoic Acid	46.4	2.76		GELC
Twomile Canyon above Highway 501	10/23	UF	CS	SVOA	Benzoic Acid	457	2.76	D	GELC
Pajarito Canyon above Highway 501	09/08	UF	CS	VOA	1,4-Dichlorobenzene	0.18	0.118		GELC
Guaje Canyon at SR-502	09/08	UF	CS	VOA	1,4-Dichlorobenzene	0.22	0.118		GELC
Los Alamos Canyon at Los Alamos	09/12	UF	CS	VOA	1,4-Dichlorobenzene	0.12	0.118		GELC

[a]Codes: UF–Unfiltered Sample; CS–customer sample; RE–reanalysis; D–analytes analyzed at a secondary dilution.
[b]HEXP–high explosives; SVOA–semivolatile organics; VOA–volatile organics.
[c]Lab qualifier: D–analytes analyzed at secondary dilution; X–probable false positive resulting from matrix interference.
[d]Lab code: PARA–Paragon Analytics, Inc.; GELC–General Engineering Laboratories, Inc.

Table 5-19. Acute and Chronic Biological Toxicity Test Results from the Los Alamos Area in 2000

Station ID	Collector	Date	Sample Type	Acute Tests Results	Chronic Tests Results
E240	LANL	Sept. 8	Runoff	No Effect	No Effect
EGS4	LANL	Sept. 8	Runoff	No Effect	No Effect
LA 12.5	NMED	Sept. 8	Surface Water	No Effect	No Effect
LA Reservoir	NMED	Sept. 8	Surface Water	No Effect	No Effect
PUN 0.01	NMED	Sept. 8	Runoff	No Effect	70% mortality
PU 6.7	NMED	Sept. 8	Runoff	No Effect	100% mortality
PU 2.0	NMED	Sept. 8	Runoff	No Effect	No Effect

Location Key

E240	Pajarito Canyon above SR 501
EGS4	Guaje Canyon above SR 4
LA 12.5	Approximately 1/4–1/2 mile upstream from LA Reservoir
LA Reservoir	Depth composite sample from center of reservoir, near the concrete standpipe
PUN 0.01	Pueblo Canyon, North Tributary (north tributary above land bridge)
PU 6.7	Pueblo Canyon above land bridge
PU 2.0	Pueblo Canyon near Bayo Treatment Plant

Table 5-20. Radiochemical Analysis of Sediments for 2000 (pCi/g[a])

Station Name	Date	Codes[b]	^{3}H (pCi/L)			^{90}Sr			^{137}Cs			^{234}U			^{235,236}U			^{238}U			U (mg/kg, lab)
Reservoirs on Rio Grande (New Mexico)																					
Cochiti Upper	09/15	CS	60	60	207	0.31	0.16	0.54	1.26	0.03	0.03	0.929	0.095	0.036	0.0461	0.0170	0.0524	1.080	0.106	0.052	
Cochiti Upper	09/15	DUP	0	58	206				1.22	0.04	0.04										
Cochiti Middle	09/15	CS	58	59	201	0.19	0.12	0.38	1.34	0.03	0.04	1.150	0.110	0.013	0.0559	0.0176	0.0433	1.280	0.120	0.050	
Cochiti Middle	09/15	CS	0	59	208	0.01	0.12	0.45	1.36	0.03	0.04	1.140	0.113	0.048	0.0642	0.0192	0.0378	1.280	0.123	0.014	
Cochiti Lower	09/15	CS	83	57	192	0.20	0.11	0.37	0.56	0.03	0.06	1.190	0.115	0.053	0.0520	0.0179	0.0530	1.240	0.119	0.036	
Reservoir Rio Chama																					
Abiquiu Lower	10/18	CS	0	58	207	-0.04	0.05	0.17	0.20	0.02	0.03	1.050	0.109	0.054	0.0586	0.0190	0.0159	1.060	0.110	0.016	
Abiquiu Lower	10/18	DUP										1.040	0.105	0.038	0.0592	0.0185	0.0379	1.060	0.106	0.038	
Abiquiu Upper	10/18	CS	60	61	208	0.05	0.05	0.16	0.02	0.01	0.02	0.795	0.085	0.053	0.0421	0.0153	0.0363	0.736	0.080	0.036	
Abiquiu Upper	10/18	DUP				0.05	0.04	0.14	0.03	0.02	0.04										
Abiquiu Middle	10/18	CS	61	62	213	0.20	0.07	0.22	0.29	0.03	0.06	1.030	0.105	0.049	0.1150	0.0265	0.0393	1.260	0.123	0.057	
Regional Stations																					
Rio Chama at Chamita (bank)	07/12	CS	170	910		0.03	0.04	0.15	0.00	0.03		0.313	0.018		0.0158	0.0043		0.308	0.018		
Rio Chama at Chamita (bank)	07/12	CS	110	910		0.00	0.05	0.15	0.04	0.03		0.357	0.019		0.0236	0.0052		0.398	0.020		
Rio Grande at Embudo (bank)	07/12	CS	50	900		-0.08	0.04	0.14	0.06	0.03		0.670	0.030		0.0252	0.0056		0.673	0.030		
Rio Grande at Otowi (bank)	06/27	CS	80	460		0.01	0.09	0.31	0.03	0.03		0.330	0.020		0.0297	0.0061		0.329	0.019		
Rio Grande at Otowi (bank)	06/27	DUP				0.13	0.10	0.34													
Rio Grande at Otowi (bank)	06/27	CS	-20	450		0.11	0.09	0.29	0.03	0.03		0.355	0.020		0.0135	0.0041		0.379	0.020		
Rio Grande at Otowi Upper (bank)	06/27	CS	10	450		0.00	0.09	0.30	0.03	0.02		0.529	0.044		0.0252	0.0107		0.579	0.045		
Rio Grande at Frijoles (bank)	08/22	CS	140	56	184	0.46	0.04		0.32	0.02	0.02	0.895	0.123	0.085	0.0637	0.0290	0.1070	0.941	0.127	0.085	
Rio Grande at Frijoles (bank)	08/22	DUP										1.120	0.147	0.114	0.0678	0.0308	0.1140	0.999	0.136	0.114	
Rio Grande at Cochiti	09/26	CS	515	51	142	0.11	0.09	0.32	1.65	0.05	0.07	1.420	0.134	0.049	0.0554	0.0191	0.0564	1.230	0.120	0.069	
Rio Grande at Bernalillo	07/11	CS	190	920		0.04	0.04	0.14	0.01	0.02		0.778	0.032		0.0357	0.0063		0.802	0.033		
Rio Grande at Bernalillo	07/11	DUP				0.11	0.04	0.14													
Jemez River	07/13	CS	170	920		0.00	0.05	0.15	0.05	0.02		0.886	0.038		0.0356	0.0071		0.753	0.033		
Pajarito Plateau Stations																					
Guaje Canyon:																					
Guaje at SR-502	06/27	CS	0	450		0.55	0.13	0.35	1.61	0.18		1.187	0.055		0.1301	0.0156		1.262	0.057		
Guaje at SR-502	06/27	CS	90	460		0.51	0.12	0.31	1.58	0.18		1.182	0.055		0.1328	0.0151		1.228	0.056		
Bayo Canyon:																					
Bayo at SR-502	06/27	CS	40	450		0.00	0.09	0.30	0.00	0.02		0.463	0.023		0.0178	0.0046		0.490	0.023		
Acid/Pueblo Canyons:																					
Pueblo 1 R	07/25	CS	90	470					3.57	0.40		1.079	0.043		0.0584	0.0078		1.278	0.048		
Pueblo 1 R	07/25	CS				0.80	0.16	0.46													
Acid Weir	07/25	CS	140	470					2.74	0.31		1.118	0.047		0.0480	0.0083		1.328	0.054		
Acid Weir	07/25	CS				1.06	0.18	0.45													
Acid Weir	07/25	DUP				0.77	0.11	0.28													
Pueblo 2	04/24	CS	510	500		-0.09	0.12		0.05	0.03		0.600	0.027		0.0290	0.0056		0.617	0.028		
Hamilton Bend Spring	04/24	CS	270	470		0.16	0.13		0.05	0.03		0.510	0.024		0.0189	0.0048		0.512	0.024		
Pueblo 3	04/24	CS	110	460		0.07	0.13		0.12	0.03		1.145	0.045		0.0463	0.0073		0.950	0.039		
Pueblo at SR-502	06/27	CS	60	460		0.50	0.11	0.29	0.05	0.02		1.192	0.062		0.0587	0.0114		0.952	0.052		
Pueblo at SR-502	06/27	DUP				0.44	0.11	0.30													

Table 5-20. Radiochemical Analysis of Sediments for 2000 (pCi/g[a]) (Cont.)

Station Name	Date	Codes[b]	^{3}H (pCi/L)			^{90}Sr			^{137}Cs			^{234}U			^{235,236}U			^{238}U			U (mg/kg, lab)	
Pajarito Plateau Stations (Cont.)																						
DP/Los Alamos Canyons:																						
Los Alamos Canyon Reservoir	08/31	CS	51	53	178	0.65	0.12		2.99	0.16	0.05	1.780	0.213	0.148	0.1760	0.0519	0.1020	1.360	0.176	0.037		
Los Alamos Canyon Reservoir	08/31	DUP							2.76	0.16	0.05											
Los Alamos at Bridge	04/04	CS	1,680	600					0.04	0.02											0.22	0.01
Los Alamos at LAO-1	04/04	CS	3,870	760					0.01	0.02											0.72	0.07
Los Alamos at Upper GS	04/24	CS	540	500		0.27	0.13		0.15	0.03		0.808	0.034		0.0479	0.0074		0.777	0.032			
DPS-1	04/04	CS	1,230	570					-0.01	0.17											0.17	0.01
DPS-4	04/04	CS	4,130	770					1.84	0.20											0.45	0.02
Los Alamos at LAO-3	04/24	CS				0.27	0.13															
Los Alamos at LAO-3	04/24	CS	330	480					0.68	0.08		1.104	0.048		0.1013	0.0124		1.090	0.047			
Los Alamos at LAO-4.5	04/04	CS	1,940	620					0.90	0.10											0.25	0.01
Los Alamos at SR-4	06/27	CS	110	460		0.29	0.11	0.32	1.41	0.16		1.168	0.046		0.0483	0.0078		1.192	0.047			
Los Alamos at Totavi	06/27	CS	80	460		0.29	0.11	0.34	0.10	0.03		0.885	0.046		0.0259	0.0078		0.981	0.049			
Los Alamos at Otowi	06/27	CS	20	450		0.41	0.12	0.34	1.02	0.12		1.157	0.050		0.1902	0.0177		1.256	0.053			
Sandia Canyon:																						
Sandia at SR-4	06/27	CS	250	470		0.18	0.09	0.30	-0.04	0.08		0.964	0.039		0.0463	0.0073		0.980	0.039			
Mortandad Canyon:																						
Mortandad near CMR Building	03/28	CS	1,740	610					0.04	0.03											0.52	0.03
Mortandad west of GS-1	03/29	CS	800	530					0.08	0.03											0.66	0.03
Mortandad at GS-1	03/29	CS	23,100	1,600					19.44	2.05											1.06	0.05
Mortandad at MCO-5	03/28	CS	4,100	770					18.02	1.90											0.36	0.00
Mortandad at MCO-5	03/28	CS																			0.15	0.01
Mortandad at MCO-7	03/28	CS	1,000	550					4.86	0.52											0.27	0.03
Mortandad at MCO-9	03/28	CS	-100	450					0.33	0.10											0.46	0.03
Mortandad at MCO-13 (A-5)	06/27	CS				0.43	0.10															
Mortandad at MCO-13 (A-5)	06/27	CS	230	470		0.43	0.11	0.29	0.47	0.06		0.931	0.038		0.0784	0.0097		0.947	0.038			
Mortandad A-6	06/27	CS	400	490		0.19	0.10	0.30	0.52	0.07		0.989	0.042		0.0903	0.0111		1.067	0.044			
Mortandad A-7	06/27	CS	320	480		0.04	0.09	0.28	0.12	0.04		0.567	0.027		0.0221	0.0051		0.611	0.028			
Mortandad at SR-4 (A-9)	06/27	CS	140	460		0.51	0.12	0.32	0.39	0.05		5.384	0.186		0.1080	0.0133		1.199	0.052			
Mortandad at Rio Grande (A-11)	09/25	CS	416	49	141	-0.05	0.09	0.32	0.01	0.01	0.03	0.339	0.051	0.054	0.0470	0.0183	0.0543	0.344	0.051	0.016		
Mortandad at Rio Grande (A-11)	09/25	DUP	423	50	143	0.04	0.07	0.26	0.01	0.02	0.04	0.435	0.062	0.107	-0.0026	0.0077	0.0636	0.545	0.069	0.043		
Cañada del Buey:																						
Cañada del Buey at SR-4	03/28	CS	400	500					0.06	0.03											0.44	0.04
Pajarito Canyon:																						
Two-Mile at SR-501	02/25	CS	270	490					0.36	0.05											1.77	0.07
Pajarito at SR-4	03/28	CS	380	490					0.41	0.05											1.49	0.03
Pajarito at SR-4	03/29	CS	320	490					0.04	0.02											0.16	0.03
Pajarito Retention Pond	10/11	CS	60	60	207	0.90	0.17	0.46	3.93	0.09	0.09	1.620	0.163	0.055	0.1080	0.0301	0.0546	1.920	0.186	0.069		
Pajarito Retention Pond	10/11	DUP										1.710	0.164	0.018	0.0745	0.0233	0.0476	1.610	0.156	0.018		
Pajarito at Rio Grande	09/26	CS	376	47	138	0.61	0.13	0.37	3.13	0.07	0.06	1.540	0.150	0.068	0.0509	0.0212	0.0757	1.260	0.129	0.075		
Potrillo Canyon:																						
Potrillo at SR-4	03/28	CS	380	500					0.25	0.04											1.08	0.03

Table 5-20. Radiochemical Analysis of Sediments for 2000 (pCi/g[a]) (Cont.)

Station Name	Date	Codes[b]	^{3}H (pCi/L)			^{90}Sr			^{137}Cs			^{234}U			^{235,236}U			^{238}U			U (mg/kg, lab)	
Pajarito Plateau Stations (Cont.)																						
Fence Canyon:																						
Fence at SR-4	03/28	CS	240	480					0.32	0.04											0.68	0.03
Fence at SR-4	03/28	CS	270	490					0.52	0.08											0.90	0.03
Cañon de Valle:																						
Cañon de Valle at SR-501	03/29	CS	300	490					0.22	0.04											0.90	0.02
Water Canyon:																						
Water at SR-501	03/29	CS	0	460					0.05	0.02											1.28	0.04
Water at SR-4	03/28	CS	300	490					0.17	0.06											0.80	0.10
Water at Rio Grande	09/26	CS	422	142	463	0.66	0.09	0.25	4.13	0.09	0.07	1.160	0.116	0.080	0.0404	0.0169	0.0575	1.030	0.105	0.039		
Indio Canyon:																						
Indio at SR-4	03/28	CS	180	480					0.25	0.04											0.49	0.03
Ancho Canyon:																						
Ancho at SR-4	03/28	CS	3,050	700					0.18	0.04											0.30	0.03
Above Ancho Spring	09/26	CS	27,800	328	138	0.16	0.11	0.38	1.02	0.05	0.06	1.290	0.126	0.051	0.1290	0.0293	0.0590	1.570	0.147	0.040		
Ancho at Rio Grande	09/26	CS	-32	40	142	-0.03	0.08	0.31	0.15	0.03	0.05	0.404	0.063	0.100	0.0502	0.0226	0.0851	0.470	0.068	0.052		
Ancho at Rio Grande	09/26	DUP																				
Chaquehui Canyon:																						
Chaquehui at Rio Grande	09/27	CS	951	153	464	0.26	0.10	0.31	0.96	0.05	0.06	1.510	0.148	0.089	0.0697	0.0216	0.0172	1.570	0.153	0.076		
Frijoles Canyon:																						
Frijoles at Monument Headquarters	08/22	CS	-19	51	175	0.06	0.03		0.18	0.02	0.03	0.732	0.112	0.173	0.0311	0.0219	0.1140	0.612	0.099	0.091		
Frijoles at Monument Headquarters	08/22	DUP				0.08	0.03		0.20	0.02	0.02											
Frijoles at Monument Headquarters	08/22	CS	99	54	181	0.00	0.03		0.21	0.02	0.02	0.769	0.114	0.089	0.0605	0.0275	0.0328	0.832	0.120	0.033		
Frijoles at Monument Headquarters	08/22	DUP	-7	55	188																	
Frijoles at Rio Grande	08/22	CS	24	54	182	0.27	0.04		1.53	0.11	0.03	1.690	0.197	0.034	0.0914	0.0366	0.1350	1.350	0.168	0.092		
TA-54 Area G:																						
G-0	04/19	CS	190	480		-0.01	0.12		0.03	0.03		0.748	0.033		0.0344	0.0063		0.795	0.034			
G-0	04/19	CS	310	490		-0.10	0.12		0.06	0.03		0.684	0.031		0.0392	0.0067		0.745	0.032			
G-1	04/19	CS	-90	460		0.05	0.12		0.05	0.03		0.670	0.034		0.0591	0.0096		0.637	0.033			
G-1	04/19	CS	-410	420		0.07	0.12		0.10	0.04		0.665	0.029		0.0332	0.0060		0.647	0.028			
G-2	04/19	CS	-220	440		0.05	0.13		0.05	0.03		0.587	0.027		0.0295	0.0061		0.587	0.027			
G-3	04/19	CS	90	470		0.05	0.13		0.12	0.03		0.798	0.035		0.0584	0.0084		0.840	0.036			
G-4 R-1	04/19	CS	20,100	1,500		0.10	0.13		0.30	0.04		0.829	0.035		0.0434	0.0071		0.872	0.036			
G-4 R-2	04/19	CS	10,400	1,100		0.21	0.13		0.27	0.04		0.854	0.036		0.0404	0.0067		0.821	0.035			
G-5	04/19	CS	1,360	580		0.12	0.13		0.07	0.03		0.452	0.017		0.0142	0.0031		0.446	0.016			
G-7	04/19	CS	-220	440		0.22	0.14		0.49	0.07		0.868	0.041		0.0524	0.0093		0.972	0.045			
G-8	04/19	CS	370	500		0.25	0.14		0.03	0.02		0.719	0.032		0.0292	0.0058		0.743	0.032			
G-9	04/19	CS	20	470		0.00	0.13		0.15	0.04		0.887	0.042		0.0639	0.0100		0.885	0.041			
G-6 R	04/24	CS	1,870	610		0.03	0.12		0.03	0.02		0.692	0.031		0.0140	0.0042		0.685	0.031			

Table 5-20. Radiochemical Analysis of Sediments for 2000 (pCi/g[a]) (Cont.)

Station Name	Date	Codes[b]	^{3}H (pCi/L)		^{90}Sr		^{137}Cs		^{234}U		^{235,236}U		^{238}U		U (mg/kg, lab)	
Pajarito Plateau Stations (Cont.)																
TA-49 Area AB:																
AB-1	04/25	CS	280	470	0.10	0.12	0.38	0.05	0.392	0.021	0.0240	0.0055	0.463	0.024		
AB-1	04/25	CS	420	490	0.00	0.11	0.32	0.05	0.447	0.023	0.0210	0.0058	0.512	0.025		
AB-2	04/25	CS	450	490	0.14	0.13	0.14	0.02	0.871	0.052	0.0395	0.0101	0.890	0.053		
AB-3	04/05	CS	1,210	560			0.26	0.05							0.90	0.06
AB-4	04/05	CS	990	540			0.22	0.04							1.03	0.05
AB-4A	04/05	CS	1,220	560			0.69	0.08							0.43	0.02
AB-5	04/05	CS	1,090	550			0.74	0.09							1.44	0.08
AB-6	04/05	CS	1,040	550			0.10	0.03							0.46	0.01
AB-7	04/05	CS	1,630	600			0.36	0.05							0.62	0.08
AB-8	04/05	CS	1,080	550			0.06	0.04							0.64	0.03
AB-9	04/05	CS	790	530			0.09	0.03							0.39	0.01
AB-10	04/05	CS	950	540			0.23	0.04							0.52	0.03
AB-11	04/05	CS	610	510			0.20	0.04							0.28	0.02
AB-11	04/05	CS	560	510			0.17	0.03							0.84	0.08
River Background[c]			3,600		1.02		0.56								4.49	
Reservoir Background[c]			500		1.19		0.98								4.58	
Former Background[d]					0.87		0.44								4.40	
SAL[e]			20,000		5.9		4.4								29.0	

Table 5-20. Radiochemical Analysis of Sediments for 2000 (pCi/g[a]) (Cont.)

Station Name	Date	Codes[b]	U (mg/kg, calc)		^{238}Pu			^{239,240}Pu			^{241}Am			Gross Alpha			Gross Beta			Gross Gamma	
Reservoirs on Rio Grande (New Mexico)																					
Cochiti Upper	09/15	CS	3.24	0.32	0.9660	1.1450	0.0306	0.1510	0.0367	0.0335	0.0187	0.0075	0.0172	18.3	5.1	2.2	29.9	2.9	3.5		
Cochiti Upper	09/15	DUP			0.0000	1.0000	0.0122	0.0179	0.0090	0.0121				21.1	6.6	7.3	36.5	5.4	9.6		
Cochiti Middle	09/15	CS	3.84	0.36	0.0114	0.0072	0.0210	0.0342	0.0124	0.0264	0.0205	0.0074	0.0070	26.5	8.7	2.3	35.7	3.0	3.5		
Cochiti Middle	09/15	CS	3.84	0.37	0.0097	0.0108	0.0389	0.0485	0.0169	0.0388	0.0441	0.0110	0.0070	24.7	3.4	1.8	36.0	3.0	3.5		
Cochiti Lower	09/15	CS	3.71	0.35	0.0105	0.0055	0.0071	0.0184	0.0074	0.0071	0.0083	0.0048	0.0075	24.0	3.1	2.1	34.6	2.8	3.2		
Reservoir Rio Chama																					
Abiquiu Lower	10/18	CS	3.18	0.33	0.0040	0.0030	0.0099	0.0135	0.0043	0.0037	0.0108	0.0060	0.0185	21.7	5.2	4.4	31.0	4.0	7.4		
Abiquiu Lower	10/18	DUP	3.18	0.32							0.0094	0.0050	0.0146	19.1	4.9	4.4	30.8	3.8	6.4		
Abiquiu Upper	10/18	CS	2.21	0.24	0.0001	0.0023	0.0124	0.0237	0.0072	0.0156	0.0118	0.0061	0.0182	9.3	1.9	1.8	20.1	1.9	2.9		
Abiquiu Upper	10/18	DUP			0.0105	0.0056	0.0163	0.0263	0.0078	0.0163											
Abiquiu Middle	10/18	CS	3.80	0.37	0.0185	0.0050	0.0036	0.0754	0.0107	0.0036	0.0092	0.0055	0.0170	18.7	3.4	2.1	25.9	2.6	3.3		
Regional Stations																					
Rio Chama at Chamita (bank)	07/12	CS	0.92	0.05	0.0004	0.0006		0.0009	0.0006		-0.0001	0.0001		3.3	1.1		2.1	0.9		1.8	0.2
Rio Chama at Chamita (bank)	07/12	CS	1.20	0.06	0.3680	0.0148		0.8714	0.0310		0.0001	0.0001		2.6	1.2		2.7	1.4		1.5	0.2
Rio Grande at Embudo (bank)	07/12	CS	2.01	0.09	0.0044	0.0022		0.0058	0.0023		0.0016	0.0005		3.0	1.7		3.9	2.4		1.9	0.2
Rio Grande at Otowi (bank)	06/27	CS	0.99	0.06	0.0009	0.0006		0.0141	0.0016		0.0023	0.0008		2.2	0.8		1.0	0.5		1.1	0.2
Rio Grande at Otowi (bank)	06/27	DUP																			
Rio Grande at Otowi (bank)	06/27	CS	1.13	0.06	0.0003	0.0003		0.0012	0.0006		0.0005	0.0003		3.5	1.6		2.1	1.2		0.9	0.2
Rio Grande at Otowi Upper (bank)	06/27	CS	1.73	0.14	0.0005	0.0005		0.0034	0.0009		0.0035	0.0011		5.8	1.6		4.4	1.3		4.3	0.4
Rio Grande at Frijoles (bank)	08/22	CS	2.83	0.38	0.0000	0.0053	0.0245	0.0079	0.0047	0.0072	0.0154	0.0054	0.0113	10.8	3.0	1.5	21.1	1.9	2.5		
Rio Grande at Frijoles (bank)	08/22	DUP	3.00	0.41	0.0043	0.0053	0.0198	0.0064	0.0049	0.0157	0.0200	0.0057	0.0042								
Rio Grande at Cochiti	09/26	CS	3.69	0.36	0.0672	0.0153	0.0150	0.1320	0.0249	0.0150	0.0375	0.0081	0.0110	21.3	3.1	1.9	35.0	2.8	2.9		
Rio Grande at Bernalillo	07/11	CS	2.40	0.10	0.0009	0.0006		0.0220	0.0026		0.0025	0.0008		6.1	2.6		4.4	2.5		1.9	0.2
Rio Grande at Bernalillo	07/11	DUP																			
Jemez River	07/13	CS	2.26	0.10	-0.0016	0.0026		0.0136	0.0052		-0.0004	0.0003		10.1	5.1		8.2	5.7		2.2	0.2
Pajarito Plateau Stations																					
Guaje Canyon:																					
Guaje at SR-502	06/27	CS	3.82	0.17	0.0042	0.0015		0.0810	0.0072		0.0220	0.0030		12.3	3.3		10.6	2.9		4.1	0.4
Guaje at SR-502	06/27	CS	3.72	0.17	0.0048	0.0012		0.0875	0.0055		0.0276	0.0039		12.1	3.3		10.3	2.9		5.3	0.5
Bayo Canyon:																					
Bayo at SR-502	06/27	CS	1.47	0.07	-0.0001	0.0002		0.0020	0.0009		-0.0001	0.0002		3.0	1.0		1.8	0.7		3.5	0.3
Acid/Pueblo Canyons:																					
Pueblo 1 R	07/25	CS	3.83	0.14	0.0066	0.0012		0.1342	0.0063		0.0639	0.0049		14.6	3.3		14.6	3.3		6.1	0.6
Pueblo 1 R	07/25	CS																			
Acid Weir	07/25	CS	3.97	0.16	0.0079	0.0016		0.1415	0.0077		0.0454	0.0041		15.7	3.5		15.6	3.5		6.0	0.6
Acid Weir	07/25	CS																			
Acid Weir	07/25	DUP																			
Pueblo 2	04/24	CS	1.85	0.08	0.0137	0.0017		1.8789	0.0571		0.0505	0.0050		3.7	1.1		1.9	0.7		2.6	0.3
Hamilton Bend Spring	04/24	CS	1.53	0.07	0.0021	0.0007		0.6013	0.0210		0.0216	0.0038		2.3	0.8		1.5	0.6		2.0	0.2
Pueblo 3	04/24	CS	2.85	0.12	0.0045	0.0009		0.8885	0.0275		0.0385	0.0044		5.7	1.5		3.0	1.0		3.7	0.4
Pueblo at SR-502	06/27	CS	2.86	0.15	0.0060	0.0011		1.1513	0.0372		0.0396	0.0040		9.8	3.1		5.2	2.0		3.7	0.4
Pueblo at SR-502	06/27	DUP																			

Table 5-20. Radiochemical Analysis of Sediments for 2000 (pCi/g[a]) (Cont.)

Station Name	Date	Codes[b]	U (mg/kg, calc)		^{238}Pu			^{239,240}Pu			^{241}Am			Gross Alpha			Gross Beta			Gross Gamma	
Pajarito Plateau Stations (Cont.)																					
DP/Los Alamos Canyons:																					
Los Alamos Canyon Reservoir	08/31	CS	4.13	0.52	0.0017	0.0038	0.0158	0.1060	0.0204	0.0183	0.0312	0.0081	0.0153	25.6	5.7	0.9	39.5	3.3	2.3		
Los Alamos Canyon Reservoir	08/31	DUP																			
Los Alamos at Bridge	04/04	CS			0.0016	0.0007		0.0067	0.0013		0.0037	0.0015		1.9	0.8		1.6	0.8		2.6	0.3
Los Alamos at LAO-1	04/04	CS			0.0023	0.0009		0.3231	0.0129		0.0039	0.0015		3.0	1.0		1.4	0.7		2.4	0.2
Los Alamos at Upper GS	04/24	CS	2.33	0.10	0.0021	0.0007		0.1461	0.0068		0.0108	0.0019		8.4	2.1		4.2	1.2		3.7	0.4
DPS-1	04/04	CS			0.0005	0.0005		0.0053	0.0013		0.0015	0.0010		2.0	0.8		1.4	0.7		2.0	0.2
DPS-4	04/04	CS			0.0301	0.0031		0.1608	0.0083		0.3451	0.0217		4.6	1.3		6.0	1.6		4.9	0.5
Los Alamos at LAO-3	04/24	CS																			
Los Alamos at LAO-3	04/24	CS	3.29	0.14	0.0175	0.0019		0.1178	0.0059		0.1324	0.0095		3.4	1.1		3.3	1.0		3.8	0.4
Los Alamos at LAO-4.5	04/04	CS			0.0219	0.0025		0.1377	0.0072		0.1756	0.0149		2.3	0.8		2.5	0.9		3.4	0.3
Los Alamos at SR-4	06/27	CS	3.57	0.14	0.0234	0.0021		0.2255	0.0090		0.2056	0.0096		5.6	1.9		3.4	1.4		2.8	0.3
Los Alamos at Totavi	06/27	CS	2.93	0.14	0.0014	0.0005		0.0270	0.0023		0.0069	0.0015		12.0	3.5		9.9	3.1		4.5	0.4
Los Alamos at Otowi	06/27	CS	3.83	0.16	0.0069	0.0013		0.1761	0.0079		0.0567	0.0049		11.3	3.4		8.4	2.8		3.8	0.4
Sandia Canyon:																					
Sandia at SR-4	06/27	CS	2.94	0.12	0.0007	0.0005		0.0046	0.0010		0.0019	0.0008		4.0	1.2		2.9	1.0		4.3	0.4
Mortandad Canyon:																					
Mortandad near CMR Building	03/28	CS			0.0263	0.0024		0.0089	0.0013		0.0182	0.0025		4.1	1.2		3.0	1.0		3.4	0.3
Mortandad west of GS-1	03/29	CS			0.0034	0.0009		0.0055	0.0011		0.0102	0.0023		2.8	0.9		1.9	0.8		2.9	0.3
Mortandad at GS-1	03/29	CS			11.7000	0.7500		17.4100	1.1200		43.7000	23.6000		64.0	12.6		28.0	5.8		21.5	2.2
Mortandad at MCO-5	03/28	CS			3.3266	0.0994		7.8130	0.2141		5.8294	0.2375		24.4	5.1		19.3	4.2		19.1	1.9
Mortandad at MCO-5	03/28	CS																			
Mortandad at MCO-7	03/28	CS			0.9933	0.0313		2.6713	0.0746		2.2140	0.0800		12.4	2.9		8.8	2.2		6.4	0.6
Mortandad at MCO-9	03/28	CS			0.0031	0.0009		0.0165	0.0020		0.0011	0.0005		4.7	1.4		3.6	1.2		4.0	0.4
Mortandad at MCO-13 (A-5)	06/27	CS																			
Mortandad at MCO-13 (A-5)	06/27	CS	2.86	0.11	0.0008	0.0005		0.0340	0.0032		0.0071	0.0016		7.4	1.9		5.1	1.4		4.2	0.4
Mortandad A-6	06/27	CS	3.22	0.13	0.0002	0.0007		0.0279	0.0030		0.0109	0.0018		10.1	2.4		6.8	1.8		4.1	0.4
Mortandad A-7	06/27	CS	1.83	0.08	0.0041	0.0013		0.0104	0.0020		0.0009	0.0006		5.3	1.5		3.8	1.2		3.5	0.3
Mortandad at SR-4 (A-9)	06/27	CS	3.62	0.16	0.0011	0.0006		0.0198	0.0023		0.0058	0.0015		10.0	2.4		5.7	1.5		4.9	0.5
Mortandad at Rio Grande (A-11)	09/25	CS	1.05	0.15	0.0121	0.0059	0.0148	0.0040	0.0029	0.0055	0.0073	0.0045	0.0135	5.3	1.2	1.9	24.6	1.9	2.4		
Mortandad at Rio Grande (A-11)	09/25	DUP	1.62	0.21										2.1	0.5	1.2	25.1	1.7	2.3		
Cañada del Buey:																					
Cañada del Buey at SR-4	03/28	CS			0.0043	0.0012		0.0102	0.0018		0.0021	0.0011		4.4	1.3		2.8	1.0		2.9	0.3
Pajarito Canyon:																					
Two-Mile at SR-501	02/25	CS			0.0015	0.0007		0.0123	0.0019		0.0018	0.0006		6.3	1.7		4.5	1.3		3.2	0.3
Pajarito at SR-4	03/28	CS			0.0131	0.0025		0.0429	0.0045		0.0057	0.0012		5.7	1.5		3.9	1.2		3.6	0.4
Pajarito at SR-4	03/29	CS			0.0165	0.0021		0.0423	0.0034		0.0046	0.0016		2.5	0.9		1.9	0.8		2.5	0.2
Pajarito Retention Pond	10/11	CS	5.76	0.55	0.0029	0.0076	0.0309	0.1150	0.0256	0.0345	0.0456	0.0145	0.0280	36.1	13.9	1.7	62.1	9.9	3.4		
Pajarito Retention Pond	10/11	DUP	4.83	0.46	0.0117	0.0144	0.0509	0.1290	0.0277	0.0351	0.0498	0.0145	0.0262								
Pajarito at Rio Grande	09/26	CS	3.77	0.38	0.0104	0.0070	0.0223	0.0952	0.0194	0.0056	0.0844	0.0118	0.0136	17.9	1.9	1.4	38.1	2.6	2.3		
Potrillo Canyon:																					
Potrillo at SR-4	03/28	CS			0.0023	0.0007		0.0137	0.0017		0.0037	0.0009		7.2	1.9		6.1	1.7		3.7	0.4

Table 5-20. Radiochemical Analysis of Sediments for 2000 (pCi/g[a]) (Cont.)

Station Name	Date	Codes[b]	U (mg/kg, calc)		^{238}Pu			^{239,240}Pu			^{241}Am			Gross Alpha			Gross Beta			Gross Gamma	
Pajarito Plateau Stations (Cont.)																					
Fence Canyon:																					
Fence at SR-4	03/28	CS			0.0006	0.0003		0.0148	0.0018		0.0055	0.0011		5.2	1.5		3.8	1.2		3.7	0.4
Fence at SR-4	03/28	CS			0.0031	0.0009		0.0206	0.0021		0.0039	0.0013		7.0	1.8		5.8	1.6		3.7	0.4
Cañon de Valle:																					
Cañon de Valle at SR-501	03/29	CS			0.0015	0.0007		0.0130	0.0019		0.0016	0.0006		8.8	2.2		5.2	1.5		2.9	0.3
Water Canyon:																					
Water at SR-501	03/29	CS			0.0012	0.0006		0.0075	0.0014		0.0034	0.0012		4.5	1.3		3.1	1.1		2.9	0.3
Water at SR-4	03/28	CS			-0.0001	0.0001		0.0078	0.0012		0.0026	0.0008		6.7	1.8		4.3	1.3		3.8	0.4
Water at Rio Grande	09/26	CS	3.08	0.31	0.0693	0.0152	0.0054	0.1440	0.0266	0.0146	0.0663	0.0098	0.0033	17.1	3.0	1.3	38.5	2.4	2.3		
Indio Canyon:																					
Indio at SR-4	03/28	CS			0.0069	0.0014		0.0118	0.0018		0.0025	0.0008		4.3	1.3		3.4	1.1		3.2	0.3
Ancho Canyon:																					
Ancho at SR-4	03/28	CS			0.0004	0.0004		0.0090	0.0014		-0.0016	0.0001		5.1	1.4		3.9	1.2		2.9	0.3
Above Ancho Spring	09/26	CS	4.73	0.44	0.0104	0.0054	0.0071	0.0390	0.0115	0.0071	0.0542	0.0091	0.0037	25.7	4.5	1.1	37.5	2.4	2.1		
Ancho at Rio Grande	09/26	CS	1.42	0.20	0.0600	0.0141	0.0058	0.0214	0.0074	0.0058	0.0105	0.0043	0.0047	5.6	1.6	1.1	27.1	2.1	2.1		
Ancho at Rio Grande	09/26	DUP			0.0205	0.0078	0.0173	0.0075	0.0039	0.0051	0.0174	0.0061	0.0128								
Chaquehui Canyon:																					
Chaquehui at Rio Grande	09/27	CS	4.71	0.46	0.0021	0.0048	0.0199	0.0620	0.0147	0.0157	0.0418	0.0088	0.0139	26.4	3.0	1.3	40.1	2.7	2.3		
Frijoles Canyon:																					
Frijoles at Monument Headquarters	08/22	CS	1.84	0.30	0.0024	0.0024	0.0065	0.0193	0.0073	0.0065	0.0078	0.0042	0.0115	5.0	1.1	1.3	29.1	2.6	2.7		
Frijoles at Monument Headquarters	08/22	DUP												3.9	1.2	1.1	27.2	2.4	2.2		
Frijoles at Monument Headquarters	08/22	CS	2.50	0.36	-0.0024	0.0025	0.0179	0.0195	0.0082	0.0179	0.0075	0.0034	0.0040	8.3	1.9	1.6	34.2	3.1	2.5		
Frijoles at Monument Headquarters	08/22	DUP																			
Frijoles at Rio Grande	08/22	CS	4.06	0.50	0.0084	0.0061	0.0195	0.0336	0.0096	0.0057	0.0320	0.0083	0.0157	27.4	6.8	1.5	40.1	4.1	2.6		
TA-54 Area G:																					
G-0	04/19	CS	2.38	0.10	0.0167	0.0017		0.0436	0.0030		0.0151	0.0022		5.2	1.5		2.9	1.0		2.9	0.3
G-0	04/19	CS	2.24	0.10	0.0109	0.0016		0.0644	0.0042		0.0049	0.0013		5.3	1.5		3.2	1.0		3.0	0.3
G-1	04/19	CS	1.92	0.10	0.0044	0.0010		0.0060	0.0012		0.0097	0.0016		5.8	1.6		3.1	1.0		2.7	0.3
G-1	04/19	CS	1.94	0.08	0.0020	0.0006		0.0062	0.0012		0.0002	0.0002		6.1	1.6		3.5	1.1		2.8	0.3
G-2	04/19	CS	1.76	0.08	0.0012	0.0011		0.0114	0.0021		0.0045	0.0011		4.9	1.4		3.2	1.0		2.6	0.3
G-3	04/19	CS	2.53	0.11	-0.0001	0.0001		0.0081	0.0013		0.0010	0.0004		6.0	1.6		4.2	1.3		3.3	0.3
G-4 R-1	04/19	CS	2.61	0.11	0.0075	0.0015		0.0272	0.0028		0.0120	0.0024		7.1	1.8		4.7	1.4		3.5	0.3
G-4 R-2	04/19	CS	2.46	0.10	0.0007	0.0005		0.0598	0.0045		0.0108	0.0018		6.6	1.7		4.3	1.3		4.6	0.5
G-5	04/19	CS	1.33	0.05	0.0106	0.0021		0.0100	0.0020		0.0188	0.0021		6.2	1.7		3.4	1.1		4.1	0.4
G-7	04/19	CS	2.92	0.13	0.3099	0.0128		0.4411	0.0170		0.1084	0.0067		8.8	2.2		5.4	1.5		3.6	0.4
G-8	04/19	CS	2.23	0.10	0.0107	0.0017		0.0344	0.0031		0.0039	0.0011		5.9	1.6		3.7	1.1		3.0	0.3
G-9	04/19	CS	2.66	0.12	0.0339	0.0030		0.0540	0.0041		0.0164	0.0023		5.2	1.5		3.6	1.1		3.4	0.3
G-6 R	04/24	CS	2.05	0.09	0.0125	0.0017		0.2411	0.0102		1.2722	0.0372		7.8	2.4		2.7	1.2		2.3	0.2

Table 5-20. Radiochemical Analysis of Sediments for 2000 (pCi/g[a]) (Cont.)

Station Name	Date	Codes[b]	U (mg/kg, calc)		^{238}Pu		^{239,240}Pu		^{241}Am		Gross Alpha		Gross Beta		Gross Gamma	
Pajarito Plateau Stations (Cont.)																
TA-49 Area AB:																
AB-1	04/25	CS	1.39	0.07	0.0015	0.0006	0.0179	0.0021	0.0071	0.0015	9.3	2.7	6.0	2.0	3.6	0.4
AB-1	04/25	CS	1.53	0.08	0.0023	0.0009	0.0118	0.0019	0.0045	0.0013	9.0	2.6	5.2	1.8	3.2	0.3
AB-2	04/25	CS	2.67	0.16	0.0015	0.0006	0.0460	0.0034	0.0128	0.0031	10.2	2.9	5.7	1.9	3.4	0.3
AB-3	04/05	CS			0.0232	0.0027	0.7610	0.0275	0.1896	0.0111	9.3	2.3	5.2	1.4	6.4	0.6
AB-4	04/05	CS			0.0052	0.0040	0.0073	0.0041	0.0189	0.0071	9.2	2.3	5.3	1.5	3.9	0.4
AB-4A	04/05	CS			0.0043	0.0014	0.0247	0.0032	0.0031	0.0009	8.3	2.1	5.9	1.6	3.8	0.4
AB-5	04/05	CS			0.0033	0.0012	0.0332	0.0039	0.0046	0.0016	7.6	1.9	6.4	1.7	4.0	0.4
AB-6	04/05	CS			0.0011	0.0007	0.0047	0.0014	0.0069	0.0030	5.3	1.5	3.8	1.1	3.8	0.4
AB-7	04/05	CS			0.0025	0.0013	0.0158	0.0024	0.0033	0.0018	6.8	1.8	5.1	1.4	3.2	0.3
AB-8	04/05	CS			0.0002	0.0003	0.0079	0.0015	0.0078	0.0035	14.7	3.3	3.1	1.0	3.0	0.3
AB-9	04/05	CS			0.0053	0.0019	0.0076	0.0021	0.0030	0.0046	6.1	1.6	3.9	1.2	2.9	0.3
AB-10	04/05	CS			0.0019	0.0008	0.0151	0.0021	0.0046	0.0014	6.5	1.7	4.7	1.3	2.7	0.3
AB-11	04/05	CS			0.0072	0.0013	0.0287	0.0027	0.0151	0.0023	7.1	1.8	4.9	1.4	3.3	0.3
AB-11	04/05	CS			0.0031	0.0011	0.0119	0.0018	0.0026	0.0010	7.1	1.8	4.3	1.3	3.5	0.3
River Background[c]			4.49		0.0087		0.0130		0.0760		15.7		17.6		8.8	
Reservoir Background[c]			4.58		0.0012		0.0201		0.0100		15.9		9.7		3.6	
Former Background[d]			4.40		0.0060		0.0230									
SAL[e]			29		27		24		22							

[a] Except where noted. Three columns are listed: the first is the analytical result; the second is the radioactive counting uncertainty (1 standard deviation); and the third is the analytical laboratory measurement-specific minimum detectable activity.

[b] Code: CS–Customer Sample; DUP–Laboratory Duplicate; TOTC–Total Concentration Calculated from Laboratory Data.

[c] Preliminary upper limit for background values (McLin et al., in preparation).

[d] Purtymun et al. (1987a).

[e] Screening Action Level, LANL Environmental Restoration Project, 1998; see text for details.

Table 5-21. Detections of Greater-Than-Background Radionuclides in River and Stream Sediments for 2000[a]

Station Name	Date	Code[b]	Analyte	Result	Uncertainty[c]	MDA[d]	Units	Lab Qual Code[e]	River Background	Result/ Background	SAL	Result/ SAL
Regional Stations												
Rio Chama at Chamita (bank)	07/12	CS	^{238}Pu	0.3680	0.0148		pCi/g		0.0087	42.30		
Rio Chama at Chamita (bank)	07/12	CS	^{239,240}Pu	0.8714	0.0310		pCi/g		0.013	67.03		
Rio Grande at Otowi (bank)	06/27	CS	^{239,240}Pu	0.0141	0.0016		pCi/g		0.013	1.08		
Rio Grande at Frijoles (bank)	08/22	CS	Gross Beta	21.1	1.9	2.5	pCi/g		17.6	1.20		
Rio Grande at Cochiti	09/26	CS	^{137}Cs	1.65	0.05	0.07	pCi/g		0.56	2.95		
Rio Grande at Cochiti	09/26	CS	Gross Alpha	21.3	3.1	1.9	pCi/g		15.7	1.36		
Rio Grande at Cochiti	09/26	CS	Gross Beta	35.0	2.8	2.9	pCi/g		17.6	1.99		
Rio Grande at Cochiti	09/26	CS	^{3}H	515	51	142	pCi/L		3,600	0.14		
Rio Grande at Cochiti	09/26	CS	^{238}Pu	0.0672	0.0153	0.0150	pCi/g	B	0.0087	7.72		
Rio Grande at Cochiti	09/26	CS	^{239,240}Pu	0.1320	0.0249	0.0150	pCi/g	B	0.013	10.15		
Rio Grande at Bernalillo	07/11	CS	^{239,240}Pu	0.0220	0.0026		pCi/g		0.013	1.69		
Pajarito Plateau Stations												
Guaje Canyon:												
Guaje at SR-502	06/27	CS	^{137}Cs	1.61	0.18		pCi/g		0.56	2.87		
Guaje at SR-502	06/27	CS	^{137}Cs	1.58	0.18		pCi/g		0.56	2.82		
Guaje at SR-502	06/27	CS	^{239,240}Pu	0.0810	0.0072		pCi/g		0.013	6.23		
Guaje at SR-502	06/27	CS	^{239,240}Pu	0.0875	0.0055		pCi/g		0.013	6.73		
Acid/Pueblo Canyons:												
Pueblo 1 R	07/25	CS	^{137}Cs	3.57	0.40		pCi/g		0.56	6.37	4.4	0.81
Pueblo 1 R	07/25	CS	^{239,240}Pu	0.1342	0.0063		pCi/g		0.013	10.32		
Acid Weir	07/25	CS	^{137}Cs	2.74	0.31		pCi/g		0.56	4.89		
Acid Weir	07/25	CS	^{239,240}Pu	0.1415	0.0077		pCi/g		0.013	10.88		
Acid Weir	07/25	CS	^{90}Sr	1.06	0.18	0.45	pCi/g		1.02	1.04		
Pueblo 2	04/24	CS	^{238}Pu	0.0137	0.0017		pCi/g		0.0087	1.57		
Pueblo 2	04/24	CS	^{239,240}Pu	1.8789	0.0571		pCi/g		0.013	144.53		
Hamilton Bend Spring	04/24	CS	^{239,240}Pu	0.6013	0.0210		pCi/g		0.013	46.25		
Pueblo 3	04/24	CS	^{239,240}Pu	0.8885	0.0275		pCi/g		0.013	68.35		
Pueblo at SR-502	06/27	CS	^{239,240}Pu	1.1513	0.0372		pCi/g		0.013	88.56		

Table 5-21. Detections of Greater-Than-Background Radionuclides in River and Stream Sediments for 2000[a] (Cont.)

Station Name	Date	Code[b]	Analyte	Result	Uncertainty[c]	MDA[d]	Units	Lab Qual Code[e]	River Background	Result/ Background	SAL	Result/ SAL
Pajarito Plateau Stations (Cont.)												
DP/Los Alamos Canyons:												
Los Alamos Canyon Reservoir	08/31	DUP	^{137}Cs	2.76	0.16	0.05	pCi/g		0.56	4.93		
Los Alamos Canyon Reservoir	08/31	CS	^{137}Cs	2.99	0.16	0.05	pCi/g		0.56	5.34	5.4	0.55
Los Alamos Canyon Reservoir	08/31	CS	Gross Alpha	25.6	5.7	0.9	pCi/g		15.7	1.63		
Los Alamos Canyon Reservoir	08/31	CS	Gross Beta	39.5	3.3	2.3	pCi/g		17.6	2.24		
Los Alamos Canyon Reservoir	08/31	CS	^{239,240}Pu	0.1060	0.0204	0.0183	pCi/g		0.013	8.15		
Los Alamos at LAO-1	04/04	CS	^{3}H	3,870	760		pCi/L		3,600	1.08		
Los Alamos at LAO-1	04/04	CS	^{239,240}Pu	0.3231	0.0129		pCi/g		0.013	24.85		
Los Alamos at Upper GS	04/24	CS	^{239,240}Pu	0.1461	0.0068		pCi/g		0.013	11.24		
DPS-4	04/04	CS	^{241}Am	0.3451	0.0217		pCi/g		0.076	4.54		
DPS-4	04/04	CS	^{137}Cs	1.84	0.20		pCi/g		0.56	3.29		
DPS-4	04/04	CS	^{3}H	4,130	770		pCi/L		3,600	1.15		
DPS-4	04/04	CS	^{238}Pu	0.0301	0.0031		pCi/g		0.0087	3.46		
DPS-4	04/04	CS	^{239,240}Pu	0.1608	0.0083		pCi/g		0.013	12.37		
Los Alamos at LAO-3	04/24	CS	^{241}Am	0.1324	0.0095		pCi/g		0.076	1.74		
Los Alamos at LAO-3	04/24	CS	^{137}Cs	0.68	0.08		pCi/g		0.56	1.22		
Los Alamos at LAO-3	04/24	CS	^{238}Pu	0.0175	0.0019		pCi/g		0.0087	2.01		
Los Alamos at LAO-3	04/24	CS	^{239,240}Pu	0.1178	0.0059		pCi/g		0.013	9.06		
Los Alamos at LAO-4.5	04/04	CS	^{241}Am	0.1756	0.0149		pCi/g		0.076	2.31		
Los Alamos at LAO-4.5	04/04	CS	^{137}Cs	0.90	0.10		pCi/g		0.56	1.61		
Los Alamos at LAO-4.5	04/04	CS	^{3}H	1,940	620		pCi/L		3,600	0.54		
Los Alamos at LAO-4.5	04/04	CS	^{238}Pu	0.0219	0.0025		pCi/g		0.0087	2.52		
Los Alamos at LAO-4.5	04/04	CS	^{239,240}Pu	0.1377	0.0072		pCi/g		0.013	10.59		
Los Alamos at SR-4	06/27	CS	^{241}Am	0.2056	0.0096		pCi/g		0.076	2.71		
Los Alamos at SR-4	06/27	CS	^{137}Cs	1.41	0.16		pCi/g		0.56	2.53		
Los Alamos at SR-4	06/27	CS	^{238}Pu	0.0234	0.0021		pCi/g		0.0087	2.69		
Los Alamos at SR-4	06/27	CS	^{239,240}Pu	0.2255	0.0090		pCi/g		0.013	17.35		
Los Alamos at Totavi	06/27	CS	^{239,240}Pu	0.0270	0.0023		pCi/g		0.013	2.08		
Los Alamos at Otowi	06/27	CS	^{137}Cs	1.02	0.12		pCi/g		0.56	1.82		
Los Alamos at Otowi	06/27	CS	^{239,240}Pu	0.1761	0.0079		pCi/g		0.013	13.55		

Table 5-21. Detections of Greater-Than-Background Radionuclides in River and Stream Sediments for 2000[a] (Cont.)

Station Name	Date	Code[b]	Analyte	Result	Uncertainty[c]	MDA[d]	Units	Lab Qual Code[e]	River Background	Result/ Background	SAL	Result/ SAL
Pajarito Plateau Stations (Cont.)												
Mortandad Canyon:												
Mortandad near CMR Building	03/28	CS	^{238}Pu	0.0263	0.0024		pCi/g		0.0087	3.02		
Mortandad at GS-1	03/29	CS	^{137}Cs	19.44	2.05		pCi/g		0.56	34.71	4.4	4.42
Mortandad at GS-1	03/29	CS	Gross Alpha	64.0	12.6		pCi/g		15.7	4.08		
Mortandad at GS-1	03/29	CS	Gross Beta	28.0	5.8		pCi/g		17.6	1.59		
Mortandad at GS-1	03/29	CS	Gross Gamma	21.5	2.2		pCi/g		8.8	2.44		
Mortandad at GS-1	03/29	CS	^{3}H	23,100	1,600		pCi/L		3,600	6.42	20,000	1.16
Mortandad at GS-1	03/29	CS	^{238}Pu	11.7000	0.7500		pCi/g		0.0087	1,344.83		
Mortandad at GS-1	03/29	CS	^{239,240}Pu	17.4100	1.1200		pCi/g		0.013	1,339.23	24	0.73
Mortandad at MCO-5	03/28	CS	^{241}Am	5.8294	0.2375		pCi/g		0.076	76.70		
Mortandad at MCO-5	03/28	CS	^{137}Cs	18.02	1.90		pCi/g		0.56	32.18	4.4	4.10
Mortandad at MCO-5	03/28	CS	Gross Alpha	24.4	5.1		pCi/g		15.7	1.55		
Mortandad at MCO-5	03/28	CS	Gross Beta	19.3	4.2		pCi/g		17.6	1.10		
Mortandad at MCO-5	03/28	CS	Gross Gamma	19.1	1.9		pCi/g		8.8	2.17		
Mortandad at MCO-5	03/28	CS	^{3}H	4,100	770		pCi/L		3,600	1.14		
Mortandad at MCO-5	03/28	CS	^{238}Pu	3.3266	0.0994		pCi/g		0.0087	382.37		
Mortandad at MCO-5	03/28	CS	^{239,240}Pu	7.8130	0.2141		pCi/g		0.013	601.00		
Mortandad at MCO-7	03/28	CS	^{241}Am	2.2140	0.0800		pCi/g		0.076	29.13		
Mortandad at MCO-7	03/28	CS	^{137}Cs	4.86	0.52		pCi/g		0.56	8.68	4.4	1.10
Mortandad at MCO-7	03/28	CS	^{238}Pu	0.9933	0.0313		pCi/g		0.0087	114.17		
Mortandad at MCO-7	03/28	CS	^{239,240}Pu	2.6713	0.0746		pCi/g		0.013	205.48		
Mortandad at MCO-9	03/28	CS	^{239,240}Pu	0.0165	0.0020		pCi/g		0.013	1.27		
Mortandad at MCO-13 (A-5)	06/27	CS	^{239,240}Pu	0.0340	0.0032		pCi/g		0.013	2.62		
Mortandad A-6	06/27	CS	^{239,240}Pu	0.0279	0.0030		pCi/g		0.013	2.15		
Mortandad at SR-4 (A-9)	06/27	CS	^{239,240}Pu	0.0198	0.0023		pCi/g		0.013	1.52		
Mortandad at Rio Grande (A-11)	09/25	DUP	Gross Beta	25.1	1.7	2.3	pCi/g		17.6	1.43		
Mortandad at Rio Grande (A-11)	09/25	CS	Gross Beta	24.6	1.9	2.4	pCi/g		17.6	1.40		
Mortandad at Rio Grande (A-11)	09/25	DUP	^{3}H	423	50	143	pCi/L		3,600	0.12		
Mortandad at Rio Grande (A-11)	09/25	CS	^{3}H	416	49	141	pCi/L		3,600	0.12		
Pajarito Canyon:												
Pajarito at Rio Grande	09/26	CS	^{241}Am	0.0844	0.0118	0.0136	pCi/g		0.076	1.11		
Pajarito at Rio Grande	09/26	CS	^{137}Cs	3.13	0.07	0.06	pCi/g		0.56	5.59	4.4	0.71
Pajarito at Rio Grande	09/26	CS	Gross Alpha	17.9	1.9	1.4	pCi/g		15.7	1.14		
Pajarito at Rio Grande	09/26	CS	Gross Beta	38.1	2.6	2.3	pCi/g		17.6	2.16		
Pajarito at Rio Grande	09/26	CS	^{3}H	376	47	138	pCi/L		3,600	0.10		
Pajarito at Rio Grande	09/26	CS	^{238}Pu	0.0223	0.0070	0.0223	pCi/g	U	0.0087	2.56		

Table 5-21. Detections of Greater-Than-Background Radionuclides in River and Stream Sediments for 2000[a] (Cont.)

Station Name	Date	Code[b]	Analyte	Result	Uncertainty[c]	MDA[d]	Units	Lab Qual Code[e]	River Background	Result/ Background	SAL	Result/ SAL
Pajarito Plateau Stations (Cont.)												
Pajarito Canyon (Cont):												
Pajarito at Rio Grande	09/26	CS	^{239,240}Pu	0.0952	0.0194	0.0056	pCi/g	B	0.013	7.32		
Pajarito at SR-4	03/28	CS	^{238}Pu	0.0131	0.0025		pCi/g		0.0087	1.51		
Pajarito at SR-4	03/28	CS	^{239,240}Pu	0.0429	0.0045		pCi/g		0.013	3.30		
Pajarito at SR-4	03/29	CS	^{238}Pu	0.0165	0.0021		pCi/g		0.0087	1.90		
Pajarito at SR-4	03/29	CS	^{239,240}Pu	0.0423	0.0034		pCi/g		0.013	3.25		
Potrillo at SR-4	03/28	CS	^{239,240}Pu	0.0137	0.0017		pCi/g		0.013	1.05		
Fence Canyon:												
Fence at SR-4	03/28	CS	^{239,240}Pu	0.0148	0.0018		pCi/g		0.013	1.14		
Fence at SR-4	03/28	CS	^{239,240}Pu	0.0206	0.0021		pCi/g		0.013	1.58		
Cañon de Valle:												
Cañon de Valle at SR-501	03/29	CS	^{239,240}Pu	0.0130	0.0019		pCi/g		0.013	1.00		
Water Canyon:												
Water at Rio Grande	09/26	CS	^{137}Cs	4.13	0.09	0.07	pCi/g		0.56	7.38	4.4	0.94
Water at Rio Grande	09/26	CS	Gross Alpha	17.1	3.0	1.3	pCi/g		15.7	1.09		
Water at Rio Grande	09/26	CS	Gross Beta	38.5	2.4	2.3	pCi/g		17.6	2.19		
Water at Rio Grande	09/26	CS	^{238}Pu	0.0693	0.0152	0.0054	pCi/g	B	0.0087	7.97		
Water at Rio Grande	09/26	CS	^{239,240}Pu	0.1440	0.0266	0.0146	pCi/g	B	0.013	11.08		
Ancho Canyon:												
Ancho at SR-4	03/28	CS	^{3}H	3,050	700		pCi/L		3,600	0.85		
Above Ancho Spring	09/26	CS	^{137}Cs	1.02	0.05	0.06	pCi/g		0.56	1.82		
Above Ancho Spring	09/26	CS	Gross Alpha	25.7	4.5	1.1	pCi/g		15.7	1.64		
Above Ancho Spring	09/26	CS	Gross Beta	37.5	2.4	2.1	pCi/g		17.6	2.13		
Above Ancho Spring	09/26	CS	^{3}H	27,800	328	138	pCi/L		3,600	7.72	20,000	1.39
Above Ancho Spring	09/26	CS	^{239,240}Pu	0.0390	0.0115	0.0071	pCi/g	B	0.013	3.00		
Above Ancho Spring	09/26	TOTC	U	4.73	0.44		mg/kg		4.49	1.05		
Ancho at Rio Grande	09/26	CS	Gross Beta	27.1	2.1	2.1	pCi/g		17.6	1.54		
Ancho at Rio Grande	09/26	CS	^{238}Pu	0.0600	0.0141	0.0058	pCi/g	B	0.0087	6.90		

Table 5-21. Detections of Greater-Than-Background Radionuclides in River and Stream Sediments for 2000[a] (Cont.)

Station Name	Date	Code[b]	Analyte	Result	Uncertainty[c]	MDA[d]	Units	Lab Qual Code[e]	River Background	Result/ Background	SAL	Result/ SAL
Pajarito Plateau Stations (Cont.)												
Chaquehui Canyon:												
Chaquehui at Rio Grande	09/27	CS	^{137}Cs	0.96	0.05	0.06	pCi/g		0.56	1.72		
Chaquehui at Rio Grande	09/27	CS	Gross Alpha	26.4	3.0	1.3	pCi/g		15.7	1.68		
Chaquehui at Rio Grande	09/27	CS	Gross Beta	40.1	2.7	2.3	pCi/g		17.6	2.28		
Chaquehui at Rio Grande	09/27	CS	^{3}H	951	153	464	pCi/L		3,600	0.26		
Chaquehui at Rio Grande	09/27	CS	^{238}Pu	0.0199	0.0048	0.0199	pCi/g	U	0.0087	2.29		
Chaquehui at Rio Grande	09/27	CS	^{239,240}Pu	0.0620	0.0147	0.0157	pCi/g	B	0.013	4.77		
Chaquehui at Rio Grande	09/27	TOTC	U	4.71	0.46		mg/kg		4.49	1.05		
Frijoles Canyon:												
Frijoles at Monument HQ	08/22	DUP	Gross Beta	27.2	2.4	2.2	pCi/g		17.6	1.55		
Frijoles at Monument HQ	08/22	CS	Gross Beta	29.1	2.6	2.7	pCi/g		17.6	1.65		
Frijoles at Monument HQ	08/22	CS	Gross Beta	34.2	3.1	2.5	pCi/g		17.6	1.94		
Frijoles at Rio Grande	08/22	CS	^{137}Cs	1.53	0.11	0.03	pCi/g		0.56	2.73		
Frijoles at Rio Grande	08/22	CS	Gross Alpha	27.4	6.8	1.5	pCi/g		15.7	1.75		
Frijoles at Rio Grande	08/22	CS	Gross Beta	40.1	4.1	2.6	pCi/g		17.6	2.28		
Frijoles at Rio Grande	08/22	CS	^{239,240}Pu	0.0336	0.0096	0.0057	pCi/g		0.013	2.58		
TA-54 Area G:												
G-0	04/19	CS	^{238}Pu	0.0167	0.0017		pCi/g		0.0087	1.92		
G-0	04/19	CS	^{238}Pu	0.0109	0.0016		pCi/g		0.0087	1.25		
G-0	04/19	CS	^{239,240}Pu	0.0436	0.0030		pCi/g		0.013	3.35		
G-0	04/19	CS	^{239,240}Pu	0.0644	0.0042		pCi/g		0.013	4.95		
G-4 R-1	04/19	CS	^{3}H	20,100	1,500		pCi/L		3,600	5.58	20,000	1.01
G-4 R-1	04/19	CS	^{239,240}Pu	0.0272	0.0028		pCi/g		0.013	2.09		
G-4 R-2	04/19	CS	^{3}H	10,400	1,100		pCi/L		3,600	2.89	20,000	0.52
G-4 R-2	04/19	CS	^{239,240}Pu	0.0598	0.0045		pCi/g		0.013	4.60		
G-5	04/19	CS	^{238}Pu	0.0106	0.0021		pCi/g		0.0087	1.22		
G-7	04/19	CS	^{241}Am	0.1084	0.0067		pCi/g		0.076	1.43		
G-7	04/19	CS	^{238}Pu	0.3099	0.0128		pCi/g		0.0087	35.62		
G-7	04/19	CS	^{239,240}Pu	0.4411	0.0170		pCi/g		0.013	33.93		
G-8	04/19	CS	^{238}Pu	0.0107	0.0017		pCi/g		0.0087	1.23		
G-8	04/19	CS	^{239,240}Pu	0.0344	0.0031		pCi/g		0.013	2.65		
G-9	04/19	CS	^{238}Pu	0.0339	0.0030		pCi/g		0.0087	3.90		
G-9	04/19	CS	^{239,240}Pu	0.0540	0.0041		pCi/g		0.013	4.15		

Table 5-21. Detections of Greater-Than-Background Radionuclides in River and Stream Sediments for 2000[a] (Cont.)

Station Name	Date	Code[b]	Analyte	Result	Uncertainty[c]	MDA[d]	Units	Lab Qual Code[e]	River Background	Result/ Background	SAL	Result/ SAL
Pajarito Plateau Stations (Cont.)												
TA-54 Area G: (Cont.)												
G-6 R	04/24	CS	^{241}Am	1.2722	0.0372		pCi/g		0.076	16.74		
G-6 R	04/24	CS	^{3}H	1,870	610		pCi/L		3,600	0.52		
G-6 R	04/24	CS	^{238}Pu	0.0125	0.0017		pCi/g		0.0087	1.44		
G-6 R	04/24	CS	^{239,240}Pu	0.2411	0.0102		pCi/g		0.013	18.55		
TA-49 Area AB:												
AB-1	04/25	CS	^{239,240}Pu	0.0179	0.0021		pCi/g		0.013	1.38		
AB-2	04/25	CS	^{239,240}Pu	0.0460	0.0034		pCi/g		0.013	3.54		
AB-3	04/05	CS	^{241}Am	0.1896	0.0111		pCi/g		0.076	2.49		
AB-3	04/05	CS	^{238}Pu	0.0232	0.0027		pCi/g		0.0087	2.67		
AB-3	04/05	CS	^{239,240}Pu	0.7610	0.0275		pCi/g		0.013	58.54		
AB-4A	04/05	CS	^{137}Cs	0.69	0.08		pCi/g		0.56	1.22		
AB-4A	04/05	CS	^{239,240}Pu	0.0247	0.0032		pCi/g		0.013	1.90		
AB-5	04/05	CS	^{137}Cs	0.74	0.09		pCi/g		0.56	1.31		
AB-5	04/05	CS	^{239,240}Pu	0.0332	0.0039		pCi/g		0.013	2.55		
AB-7	04/05	CS	^{239,240}Pu	0.0158	0.0024		pCi/g		0.013	1.22		
AB-10	04/05	CS	^{239,240}Pu	0.0151	0.0021		pCi/g		0.013	1.16		
AB-11	04/05	CS	^{239,240}Pu	0.0287	0.0027		pCi/g		0.013	2.21		
Pajarito Canyon:												
Pajarito Retention Pond	10/11	CS	^{137}Cs	3.93	0.09	0.09	pCi/g		0.56	7.02	4.4	0.89
Pajarito Retention Pond	10/11	CS	Gross Beta	62.1	9.9	3.4	pCi/g		17.6	3.53		
Pajarito Retention Pond	10/11	DUP	^{238}Pu	0.0509	0.0144	0.0509	pCi/g	U	0.0087	5.85		
Pajarito Retention Pond	10/11	CS	^{238}Pu	0.0309	0.0076	0.0309	pCi/g	U	0.0087	3.55		
Pajarito Retention Pond	10/11	DUP	^{239,240}Pu	0.1290	0.0277	0.0351	pCi/g	B	0.013	9.92		
Pajarito Retention Pond	10/11	CS	^{239,240}Pu	0.1150	0.0256	0.0345	pCi/g	B	0.013	8.85		
Pajarito Retention Pond	10/11	TOTCD	U	4.83	0.46		mg/kg		4.49	1.07		
Pajarito Retention Pond	10/11	TOTC	U		5.76	0.55	mg/kg		4.49	1.28		

[a]Above background detection defined as ≥ 3× uncertainty and ≥ detection limit and ≥ background. Values indicated by entries in SAL column are greater than half of the SAL. Note that some results in this table were qualified as nondetections by the analytical laboratory. All tritium detections are shown.
[b]Codes: CS–Customer Sample; DUP–Duplicate; TRP–Triplicate; RE–Reanalysis; TOTC–Value Calculated from Other Results; TOTCD–Duplicate Calculated Value.
[c]One standard deviation radioactivity counting uncertainty.
[d]MDA = minimum detectable activity.
[e]Codes: B–analyte found in lab blank; U–analyte not detected.

Table 5-22. Detections of Greater-Than-Background Radionuclides in Reservoir Sediments for 2000[a]

Station Name	Date	Code[b]	Analyte	Result	Uncertainty[c]	MDA	Units	Lab Qual Code[d]	Reservoir Background	Result/ Background
Reservoirs on Rio Grande (New Mexico)										
Cochiti Upper	09/15	CS	^{137}Cs	1.26	0.03	0.03	pCi/g		0.98	1.29
Cochiti Upper	09/15	DUP	^{137}Cs	1.22	0.04	0.04	pCi/g		0.98	1.24
Cochiti Upper	09/15	CS	Gross Alpha	18.3	5.1	2.2	pCi/g		15.9	1.15
Cochiti Upper	09/15	DUP	Gross Alpha	21.1	6.6	7.3	pCi/g		15.9	1.33
Cochiti Upper	09/15	CS	Gross Beta	29.9	2.9	3.5	pCi/g		9.7	3.08
Cochiti Upper	09/15	DUP	Gross Beta	36.5	5.4	9.6	pCi/g		9.7	3.76
Cochiti Upper	09/15	CS	^{238}Pu	0.9660	0.1450	0.0211	pCi/g		0.0012	805.00
Cochiti Upper	09/15	CS	^{239,240}Pu	0.1230	0.0255	0.0078	pCi/g	B	0.02	6.15
Cochiti Middle	09/15	CS	^{241}Am	0.0441	0.0110	0.0070	pCi/g	B	0.01	4.41
Cochiti Middle	09/15	CS	^{137}Cs	1.34	0.03	0.04	pCi/g		0.98	1.37
Cochiti Middle	09/15	CS	^{137}Cs	1.36	0.03	0.04	pCi/g		0.98	1.39
Cochiti Middle	09/15	CS	Gross Alpha	26.5	8.7	2.3	pCi/g		15.9	1.67
Cochiti Middle	09/15	CS	Gross Alpha	24.7	3.4	1.8	pCi/g		15.9	1.55
Cochiti Middle	09/15	CS	Gross Beta	35.7	3.0	3.5	pCi/g		9.7	3.68
Cochiti Middle	09/15	CS	Gross Beta	36.0	3.0	3.5	pCi/g		9.7	3.71
Cochiti Middle	09/15	CS	^{238}Pu	0.0389	0.0108	0.0389	pCi/g	U	0.0012	32.42
Cochiti Lower	09/15	CS	Gross Alpha	24.0	3.1	2.1	pCi/g		15.9	1.51
Cochiti Lower	09/15	CS	Gross Beta	34.6	2.8	3.2	pCi/g		9.7	3.57
Reservoirs on Rio Chama (New Mexico)										
Abiquiu Lower	10/18	CS	Gross Alpha	21.7	5.2	4.4	pCi/g		15.9	1.36
Abiquiu Lower	10/18	DUP	Gross Alpha	19.1	4.9	4.4	pCi/g		15.9	1.20
Abiquiu Lower	10/18	CS	Gross Beta	31.0	4.0	7.4	pCi/g		9.7	3.20
Abiquiu Lower	10/18	DUP	Gross Beta	30.8	3.8	6.4	pCi/g		9.7	3.18
Abiquiu Upper	10/18	CS	Gross Beta	20.1	1.9	2.9	pCi/g		9.7	2.07
Abiquiu Upper	10/18	CS	^{239,240}Pu	0.0237	0.0072	0.0156	pCi/g		0.02	1.19
Abiquiu Upper	10/18	DUP	^{239,240}Pu	0.0263	0.0078	0.0163	pCi/g		0.02	1.32
Abiquiu Middle	10/18	CS	Gross Alpha	18.7	3.4	2.1	pCi/g		15.9	1.18
Abiquiu Middle	10/18	CS	Gross Beta	25.9	2.6	3.3	pCi/g		9.7	2.67
Abiquiu Middle	10/18	CS	^{238}Pu	0.0185	0.0050	0.0036	pCi/g		0.0012	15.42
Abiquiu Middle	10/18	CS	^{239,240}Pu	0.0754	0.0107	0.0036	pCi/g		0.02	3.77

[a] Above background detection defined as ≥ 3× uncertainty and ≥ detection limit and ≥ background. No values exceeded half of the SAL. Note that some results in this table were qualified as non-detections by the analytical laboratory. All tritium detections are shown.
[b] Codes: CS–Customer Sample; DUP–Duplicate; TRP–Triplicate; RE–Reanalysis; TOTC–Value Calculated from Other Results; TOTCD–Duplicate Calculated Value.
[c] One standard deviation radioactivity counting uncertainty.
[d] Codes: B–analyte found in lab blank; U–analyte not detected.

Table 5-23. Radiochemical Analysis of Sediments for 1999 (pCi/g[a])

Station Name	Date	Code	^{3}H (pCi/L)		^{137}Cs		U (mg/kg)		^{238}Pu		$^{239, 240}$Pu		^{241}Am		Gross Alpha		Gross Beta		Gross Gamma	
Regional Stations																				
Rio Chama at Chamita	05/04	1	90	600	0.05	0.01	0.90	0.20	0.0028	0.0018	0.0025	0.0014	0.0104	0.0023	3.14	1.47	2.97	1.53	2.4	0.2
Rio Grande at Embudo	05/04	1	140	600	0.13	0.02	1.20	0.20	-0.0010	0.0003	0.0019	0.0029	0.0023	0.0010	3.91	1.80	3.80	1.90	1.2	0.2
Rio Grande at Otowi (bank)	08/03	1	140	610	0.02	0.03	0.86	0.08	0.0007	0.0007	0.0001	0.0009	0.0192	0.0028	1.67	0.69	1.09	0.55	1.9	0.2
Rio Grande at Otowi Upper(bank)	08/03	1	80	610	0.01	0.03	1.70	0.10	0.0029	0.0011	0.0012	0.0008	0.0242	0.0038	3.87	1.52	2.86	1.27	3.0	0.3
Rio Grande at Frijoles (bank)	12/21	1	-290	670	0.06	0.03	1.02	0.05	0.0005	0.0004	0.0042	0.0010	-0.0009	0.0014	2.84	1.24	2.41	1.10	2.1	0.2
Rio Grande at Cochiti Spillway	09/23	1	-40	740	0.12	0.02	1.11	0.07	0.0016	0.0009	0.0046	0.0014	0.0027	0.0009	3.97	1.54	2.33	1.13	2.3	0.2
Rio Grande at Bernalillo	05/04	1	190	600	0.14	0.02	1.30	0.20	0.0100	0.0029	0.0088	0.0028	0.0027	0.0009	3.35	1.87	2.12	1.79	2.3	0.2
Jemez River	08/02	1	130	610	0.05	0.04	0.50	0.04	0.0063	0.0012	0.0030	0.0008	0.0022	0.0008	0.91	0.69	1.00	0.73	2.6	0.3
Reservoirs on Rio Chama (New Mexico)																				
Heron Upper	08/31	1	-190	600	0.38	0.05	1.20	0.20					0.0105	0.0063	3.99	1.20	3.66	1.21	2.6	0.3
Heron Middle	08/31	1	130	630	0.27	0.04	1.20	0.10					0.0042	0.0030	4.00	1.20	2.82	1.04	4.8	0.5
Heron Lower	08/31	1	740	670	0.23	0.04	1.10	0.20					0.1881	0.0851	6.85	1.78	4.23	1.32	5.5	0.5
El Vado Upper	09/02	1					3.10	0.40												
El Vado Upper	08/31	1	600	660	0.19	0.03							0.0074	0.0045	5.32	1.47	3.15	1.11	2.8	0.3
El Vado Middle	08/31	1	190	630	0.18	0.04	1.80	0.10					0.0050	0.0033	6.25	1.66	4.18	1.31	3.3	0.3
El Vado Lower	08/31	1	80	620	0.23	0.03	1.40	0.20					0.0076	0.0046	4.83	1.37	3.43	1.17	3.1	0.3
Abiquiu Upper	08/30	1					2.40	0.30												
Abiquiu Middle	10/12	1	3,090	920	0.40	0.05	2.10	0.50					0.0067	0.0013	12.60	3.71	7.47	2.62	3.2	0.3
Abiquiu Middle	10/12	1D	4,440	980	0.13	0.03							0.0059	0.0020	7.12	2.23	5.75	1.95	2.4	0.2
Abiquiu Lower	10/12	1	3,320	930	0.11	0.03	1.90	0.20					0.0021	0.0008	4.94	1.76	3.42	1.41	1.9	0.2
Abiquiu Lower	10/12	1D	6,500	1,100	0.12	0.03							0.0043	0.0012	6.11	2.02	4.47	1.66	1.8	0.2
Reservoirs on Rio Grande (Colorado)																				
Rio Grande Upper	09/02	1	-150	600	0.67	0.08	3.30	0.30					0.0037	0.0021	11.00	2.58	7.90	2.03	4.5	0.5
Rio Grande Middle	09/02	1	50	620	0.37	0.05	1.70	0.20					0.0186	0.0103	10.40	2.47	6.33	1.73	4.1	0.4
Rio Grande Lower	09/02	1	210	630	0.57	0.08	2.90	0.40					0.0087	0.0041	10.50	2.48	7.33	1.92	4.0	0.4
Rio Grande Lower	09/02	2	-190	600	0.53	0.07	1.70	0.20					0.0094	0.0044	10.10	2.41	6.78	1.82	4.3	0.4
Reservoirs on Rio Grande (New Mexico)																				
Cochiti Upper	10/13	1	-250	730	0.16	0.05	3.90	0.20					0.0048	0.0020	6.67	2.43	5.27	2.11	2.4	0.2
Cochiti Middle	10/13	1	980	800	0.30	0.05	2.90	0.30					0.0092	0.0029	8.88	3.29	8.88	3.31	3.3	0.3
Cochiti Middle	10/13	2	130	750	0.26	0.05	2.30	0.20					0.0226	0.0040	9.07	2.96	6.70	2.44	3.3	0.3
Cochiti Lower	10/13	1	100	750	0.30	0.05	3.70	0.30					0.0170	0.0054	10.80	3.72	10.50	3.68	3.4	0.3
Other Reservoirs (New Mexico)																				
Guaje Reservoir	11/16	1	1,480	700	0.51	0.10	10.90	0.60					0.0620	0.0048	22.30	4.73	14.40	3.26	4.1	0.3
Guaje Reservoir	11/16	1D			0.56	0.07									23.00	4.87	13.30	3.05	3.7	0.4
Pajarito Plateau Stations																				
Guaje Canyon:																				
Guaje at SR-502	12/01	1	-120	690	0.05	0.02	0.29	0.02	0.0043	0.0010	0.0019	0.0007	-0.0006	0.0009	2.60	0.90	2.49	0.87	3.0	0.3
Guaje at SR-502	12/01	2	240	710	0.08	0.04	0.22	0.02	0.0012	0.0008	0.0018	0.0007	0.0045	0.0012	2.52	0.89	1.98	0.75	2.9	0.3

Table 5-23. Radiochemical Analysis of Sediments for 1999 (pCi/g[a]) (Cont.)

Station Name	Date	Code	^{3}H (pCi/L)		^{137}Cs		U (mg/kg)		^{238}Pu		^{239,240}Pu		^{241}Am		Gross Alpha		Gross Beta		Gross Gamma	
Regional Stations (Cont.)																				
Bayo Canyon:																				
Bayo at SR-502	08/03	1	150	610	0.06	0.01	0.32	0.03	0.0028	0.0010	0.0024	0.0013	0.0082	0.0021	3.02	1.00	1.84	0.74	2.7	0.3
Acid/Pueblo Canyons:																				
Acid Weir	04/27	1	190	630	0.20	0.04	0.58	0.02	0.0290	0.0023	6.6021	0.1717	0.4200	0.0140	16.00	3.54	4.47	1.37	2.2	0.2
Pueblo 1	04/27	1	40	620	0.02	0.02	0.25	0.02	-0.0002	0.0002	0.0049	0.0011	0.0020	0.0007	2.97	0.98	2.86	1.05	2.3	0.2
Pueblo 2	05/24	1	480	630	0.04	0.01	0.20	0.03	0.0005	0.0005	0.9672	0.0313	0.0317	0.0037	2.96	0.99	1.43	0.68	2.5	0.2
Hamilton Bend Spring	05/24	1	290	620	0.04	0.01	0.35	0.04	0.0038	0.0013	0.5096	0.0209	0.0226	0.0038	2.87	0.97	2.19	0.85	3.2	0.3
Pueblo 3	05/24	1	500	640	0.01	0.06	0.18	0.03	0.0038	0.0011	0.2046	0.0092	0.0111	0.0020	1.92	0.75	1.72	0.74	2.9	0.3
Pueblo 3	05/24	2	260	620	0.00	0.09	0.27	0.03	0.0012	0.0006	0.1796	0.0083	0.0120	0.0059	1.40	0.62	1.67	0.73	2.8	0.3
Pueblo at SR-502	08/04	1	-20	600	0.03	0.02	0.59	0.05	0.0031	0.0010	1.0782	0.0336	0.0353	0.0042	5.33	1.85	5.15	1.82	3.4	0.3
DP/Los Alamos Canyons:																				
Los Alamos at Bridge	04/27	1	100	620	0.05	0.03	0.35	0.02	0.0016	0.0007	0.0027	0.0009	0.0021	0.0007	3.78	1.15	2.93	1.07	2.6	0.3
Los Alamos at Bridge	04/27	2	70	620	0.09	0.02	0.77	0.03	0.0010	0.0006	0.0025	0.0007	0.0013	0.0005	4.87	1.38	3.55	1.19	2.3	0.2
Los Alamos at LAO-1	04/23	1	30	590	0.10	0.01	0.90	0.40	0.0141	0.0019	0.1384	0.0065	0.0063	0.0014	4.09	1.23	2.89	1.00	2.3	0.2
DPS-1	04/23	1	1,830	720	0.31	0.04	0.60	0.30	0.0105	0.0018	0.0246	0.0027	0.1087	0.0079	2.49	0.87	2.53	0.90	2.0	0.2
DPS-4	04/27	1	560	660	1.59	0.18	0.33	0.02	0.0277	0.0036	0.0989	0.0071	0.2562	0.0098	3.77	1.15	6.17	1.70	4.6	0.5
Los Alamos at Upper GS	04/23	1	540	630	0.08	0.01	0.40	0.20	0.0006	0.0005	0.2182	0.0087	0.0051	0.0012	2.30	0.84	1.41	0.67	1.9	0.2
Los Alamos at LAO-3	04/23	1	190	600	0.69	0.08	0.60	0.40	0.0022	0.0009	0.3185	0.0131	0.1011	0.0061	2.67	0.93	3.95	1.22	1.5	0.2
Los Alamos at LAO-4.5	04/23	1	-80	580	1.26	0.14	0.50	0.40	0.0233	0.0021	0.1088	0.0052	0.1488	0.0086	2.63	0.92	3.12	1.05	1.4	0.2
Los Alamos at SR-4	08/03	1	240	620	0.05	0.04	0.66	0.03	0.0051	0.0015	0.0344	0.0032	0.0516	0.0052	2.99	1.00	2.99	1.00	3.3	0.3
Los Alamos at Totavi	08/03	1	150	610	0.02	0.03	0.45	0.02	0.0011	0.0010	0.0074	0.0019	0.0005	0.0007	3.78	1.17	2.56	0.90	2.5	0.3
Los Alamos at Otowi	08/03	1	460	640	0.08	0.04	0.48	0.04	0.0016	0.0010	0.0430	0.0040	0.0245	0.0042	5.99	1.62	3.68	1.15	3.0	0.3
Sandia Canyon:																				
Sandia at SR-4	08/03	1	270	620	0.05	0.04	0.11	0.02	0.0023	0.0009	0.0003	0.0005	0.0096	0.0026	2.01	0.78	1.86	0.74	2.5	0.3
Mortandad Canyon:																				
Mortandad near CMR Building	04/29	1	50	610	0.00	0.03	0.27	0.01	0.0324	0.0045	0.0201	0.0036	0.0104	0.0038	4.52	1.32	3.30	1.07	1.9	0.2
Mortandad west of GS-1	04/29	1	530	640	0.24	0.04	1.99	0.03	0.0159	0.0031	0.0409	0.0050	0.0170	0.0043	5.75	1.57	4.78	1.38	2.9	0.3
Mortandad at GS-1	04/29	1	4,870	900	16.50	1.80	0.38	0.01	12.1292	0.3870	10.4218	0.3333	10.0123	0.2505	82.50	16.90	20.70	5.17	16.2	1.6
Mortandad at MCO-5	04/29	1	2,260	750	18.00	2.00	0.23	0.01	3.2056	0.1131	8.0920	0.2771	4.7110	3.1690	23.30	4.93	17.10	0.45	16.5	1.6
Mortandad at MCO-5	04/29	2	3,500	830	21.90	2.40	0.53	0.01	31.2870	1.1610	78.3171	2.8163	10.0212	5.9980	9.22	2.25	7.61	1.94	20.4	2.0
Mortandad at MCO-7	04/29	1	1,080	680	4.21	0.47	0.35	0.02	0.6212	0.0302	1.9244	0.0790	1.9746	0.0835	8.58	2.13	6.77	1.78	4.8	0.5
Mortandad at MCO-9	04/29	1	370	630	0.38	0.05	1.13	0.01	0.0146	0.0030	0.0497	0.0054	0.0109	0.0022	4.94	1.41	4.50	1.32	5.3	0.5
Mortandad at MCO-13 (A-5)	08/05	2	180	620	0.22	0.05	1.30	0.20	0.0044	0.0015	0.0211	0.0025	0.0088	0.0022	7.60	1.93	5.21	1.46	3.1	0.3
Mortandad at MCO-13 (A-5)	08/05	1	230	620	0.34	0.05	0.55	0.07	0.0009	0.0006	0.0164	0.0023	0.0203	0.0057	6.06	1.63	4.86	1.39	3.3	0.3
Mortandad A-6	08/05	1	440	630	0.39	0.07	0.81	0.03	0.0008	0.0006	0.0176	0.0024	0.0240	0.0043	12.10	2.80	7.91	2.00	3.7	0.4
Mortandad A-7	08/05	1	210	620	0.17	0.05	0.69	0.08	0.0030	0.0010	0.0131	0.0020	0.0092	0.0018	4.92	1.40	4.45	1.31	3.1	0.3
Mortandad at SR-4 (A-9)	08/05	2	260	620	0.20	0.05	1.30	0.20	0.0051	0.0015	0.0049	0.0013	0.0352	0.0039	9.54	2.31	7.30	1.88	4.0	0.4
Mortandad at SR-4 (A-9)	08/05	1	140	610	0.15	0.05	1.40	0.30	0.0001	0.0004	0.0064	0.0014	0.0038	0.0014	4.32	1.28	3.74	1.16	3.8	0.4
Mortandad at Rio Grande (A-11)	09/20	1	60	750	0.02	0.02	0.43	0.02	0.0028	0.0012	0.0043	0.0015	0.0014	0.0009	3.04	1.01	3.27	1.06	2.8	0.3

Table 5-23. Radiochemical Analysis of Sediments for 1999 (pCi/g[a]) (Cont.)

Station Name	Date	Code	^{3}H (pCi/L)		^{137}Cs		U (mg/kg)		^{238}Pu		^{239,240}Pu		^{241}Am		Gross Alpha		Gross Beta		Gross Gamma	
Regional Stations (Cont.)																				
Cañada del Buey:																				
Cañada del Buey at SR-4	05/24	1	220	620	0.04	0.01	0.28	0.05	0.0015	0.0008	0.0066	0.0014	-0.0007	0.0006	1.77	0.71	1.50	0.69	2.1	0.2
CDB_01	07/20	1	130	610	0.11	0.02	0.58	0.06	0.0029	0.0009	0.0087	0.0014	0.0052	0.0096	6.00	1.50	4.81	0.90	3.4	0.3
CDB_02	07/20	1	60	610	0.22	0.03	0.98	0.03	0.0013	0.0008	0.0016	0.0008	-0.0046	0.0091	5.90	1.40	4.19	0.82	3.2	0.3
CDB_02	07/20	2	-70	600	0.20	0.02	0.81	0.06	0.0039	0.0013	0.0112	0.0019	-0.0066	0.0088	8.40	1.90	4.14	0.82	3.3	0.3
CDB_02	07/20	3	-40	600	0.19	0.03	0.78	0.05	0.0013	0.0007	0.0100	0.0016	-0.0070	0.0088	5.20	1.40	4.21	0.83	3.1	0.3
TA-54 Area G:																				
G-0	04/14	2	890	690	0.10	0.02	1.10	0.10	0.0124	0.0024	0.1255	0.0087	0.0916	0.0061	6.71	1.76	4.04	1.23	3.7	0.4
G-0	04/14	1D					3.13	0.31												
G-0	04/14	1	880	690	0.15	0.03	1.50	0.10	0.0237	0.0030	0.1072	0.0069	0.0523	0.0046	6.92	1.80	4.38	1.29	3.6	0.4
G-0	04/14	2D					3.11	0.31												
G-1	04/14	1	350	650	0.22	0.06	0.68	0.04	0.0245	0.0030	0.0105	0.0020	0.0022	0.0009	2.01	0.78	1.87	0.76	2.7	0.3
G-2	04/14	1	1,020	700	0.06	0.01	0.94	0.07	0.0019	0.0009	0.0077	0.0016	0.0016	0.0007	3.19	1.03	2.50	0.89	2.5	0.3
G-3	04/14	1	590	670	0.19	0.03	1.46	0.04	0.0030	0.0010	0.0162	0.0022	0.0055	0.0013	6.48	1.72	4.85	1.40	3.3	0.3
G-4																				
G-4 R-1	04/14	1	4,100	880	0.18	0.03	1.35	0.09	0.0066	0.0015	0.0469	0.0043	0.0093	0.0020	3.00	1.00	2.39	0.88	2.9	0.3
G-4 R-2	04/14	1	2,560	790	0.32	0.04	0.34	0.02	0.0041	0.0015	0.0662	0.0052	0.0160	0.0024	6.34	1.69	4.76	1.37	3.6	0.4
G-5	04/14	1	1,210	710	0.08	0.01	1.24	0.07	0.0132	0.0029	0.0570	0.0056	0.0311	0.0034	5.31	1.48	3.89	1.20	3.0	0.3
G-6 R	04/14	1	530	660	0.03	0.01	0.48	0.02	0.0097	0.0024	0.2446	0.0144	0.0526	0.0069	3.38	1.09	2.22	0.84	2.8	0.3
G-7	04/15	2	3,100	800	0.31	0.04	1.17	0.05	0.1624	0.0088	0.2189	0.0108	0.0428	0.0050	6.03	1.62	4.18	1.27	2.7	0.3
G-7	04/15	1	3,010	790	0.30	0.04	0.49	0.02	0.1472	0.0082	0.2612	0.0121	0.0926	0.0073	6.66	1.75	5.99	1.63	3.6	0.4
G-8	04/14	1	300	650	0.10	0.02	0.99	0.05	0.0069	0.0018	0.0101	0.0022	0.0111	0.0024	1.90	0.75	1.66	0.71	3.3	0.3
G-9	04/14	1	400	660	0.11	0.02	4.30	0.20	0.3702	0.0161	0.4851	0.0199	0.0185	0.0028	5.59	1.54	4.64	1.35	2.6	0.3
G3_01	07/20	1	190	620	0.03	0.01	0.90	0.10	0.0045	0.0014	0.0519	0.0047	0.0087	0.0098	2.48	0.71	1.92	0.57	2.7	0.3
G3_01	07/20	3													3.90	1.00	2.88	0.69		
G3_01	07/20	2	260	620	0.07	0.01	0.66	0.04	0.0124	0.0022	0.0357	0.0038	-0.0044	0.0091	3.99	1.00	3.21	0.70	4.0	0.4
G3_02	07/20	2													2.17	0.65	1.79	0.58		
G3_02	07/20	1	1,400	700	0.02	0.01	0.58	0.05	0.0106	0.0022	0.0238	0.0032	0.0083	0.0098	5.20	1.20	2.73	0.69	3.4	0.3
Twisp Dome at Silt Fence	07/29	1	6,800	1,000	0.07	0.02	0.93	0.05	0.0170	0.0027	0.4265	0.0196	0.2229	0.0691	6.98	1.80	3.45	1.17	4.9	0.5
Pajarito Canyon:																				
Two-Mile at SR-501	03/31	1D					0.43	0.03												
Two-Mile at SR-501	03/31	1	390	640	0.13	0.02	1.36	0.14	0.0014	0.0010	0.0050	0.0015	0.0143	0.0080	5.24	1.45	4.13	1.25	2.3	0.2
Pajarito at SR-501	03/31	1	300	640	0.05	0.01	1.00	0.10	0.0010	0.0006	0.0040	0.0011	0.0059	0.0075	2.12	0.80	1.60	0.71	2.2	0.2
Pajarito at SR-501	03/31	1D					0.41	0.02												
Pajarito at SR-4	04/15	1	270	610	0.58	0.06	2.00	0.10	0.4241	0.0183	0.0701	0.0055	0.0108	0.0037	3.28	1.06	2.73	0.97	5.0	0.5
Potrillo Canyon:																				
Potrillo at SR-4	03/31	1	880	680	0.09	0.01	1.62	0.16	0.0003	0.0014	0.0017	0.0011	0.0091	0.0081	3.52	1.11	3.08	1.03	2.6	0.3
Potrillo at SR-4	03/31	1D					1.10	0.20												
Potrillo at SR-4	05/24	1					0.35	0.03												

Table 5-23. Radiochemical Analysis of Sediments for 1999 (pCi/g[a]) (Cont.)

Station Name	Date	Code	^{3}H (pCi/L)		^{137}Cs		U (mg/kg)		^{238}Pu		^{239,240}Pu		^{241}Am		Gross Alpha		Gross Beta		Gross Gamma	
Regional Stations (Cont.)																				
Fence Canyon:																				
Fence at SR-4	04/15	1	570	630	0.52	0.06	0.43	0.03	0.0010	0.0013	0.0273	0.0035	0.0084	0.0018	8.73	2.15	6.35	1.70	5.8	0.6
Cañon de Valle:																				
Cañon de Valle at SR-501	03/31	1D					0.66	0.05												
Cañon de Valle at SR-501	03/31	1	590	650	0.58	0.06	2.19	0.22	0.0021	0.0014	0.0387	0.0045	0.0096	0.0077	6.70	1.76	5.97	1.63	3.6	0.4
Water Canyon:																				
Water at SR-501	03/31	1D					0.48	0.05												
Water at SR-501	03/31	1	150	620	0.08	0.01	1.36	0.14	0.0003	0.0016	0.0061	0.0018	-0.0088	0.0067	2.01	0.80	2.54	0.92	2.4	0.2
Water at SR-4	03/31	1D					1.20	0.30												
Water at SR-4	03/31	1	690	660	0.08	0.01	1.44	0.14	-0.0011	0.0019	-0.0017	0.0015	0.0028	0.0086	4.35	1.28	3.71	1.17	4.2	0.4
Water at Rio Grande																				
Indio Canyon:																				
Indio at SR-4	03/31	1	1,160	690	0.10	0.02	1.30	0.13	0.0021	0.0011	0.0045	0.0016	-0.0037	0.0069	2.67	0.92	2.59	0.93	5.1	0.5
Indio at SR-4	03/31	1D					1.01	0.09												
Ancho Canyon:																				
Ancho at SR-4	03/31	2D					0.80	0.01												
Ancho at SR-4	03/31	1	3,870	860	0.13	0.02	1.71	0.17	-0.0015	0.0019	0.0081	0.0023	0.0073	0.0074	2.59	0.90	2.48	0.90	4.1	0.4
Ancho at SR-4	03/31	2	3,040	810	0.08	0.01	1.65	0.17	0.0003	0.0006	0.0039	0.0013	0.0098	0.0006	2.63	0.90	2.43	0.90	3.3	0.3
Ancho at SR-4	03/31	1D					0.90	0.06												
Above Ancho Spring	09/21	1	150	750	0.30	0.06	0.89	0.05	0.0041	0.0014	0.0113	0.0023	0.0170	0.0024	4.84	1.38	3.68	1.15	3.4	0.3
Ancho at Rio Grande	09/21	1	-60	740	0.29	0.07	0.78	0.03	0.0003	0.0005	0.0092	0.0016	0.0120	0.0019	4.28	1.27	3.74	1.16	3.7	0.4
Chaquehui Canyon:																				
Chaquehui at Rio Grande	09/22	1	110	750	0.69	0.11	1.85	0.08	0.0033	0.0014	0.0272	0.0035	0.0090	0.0023	6.92	1.80	4.64	1.35	3.7	0.4
Chaquehui at Rio Grande	09/22	2	130	750	0.65	0.09	1.52	0.08	0.0026	0.0014	0.0456	0.0052	0.0130	0.0026	7.19	1.85	5.14	1.45	3.9	0.4
Chaquehui at Rio Grande	09/22	1	110	750	0.69	0.11	1.85	0.08	0.0033	0.0014	0.0272	0.0035	0.0090	0.0023	6.92	1.80	4.64	1.35	3.7	0.4
Chaquehui at Rio Grande	09/22	2	130	750	0.65	0.09	1.52	0.08	0.0026	0.0014	0.0456	0.0052	0.0130	0.0026	7.19	1.85	5.14	1.45	3.9	0.4
TA-49, Area AB:																				
AB-1	04/21	1	350	630	0.37	0.05	1.80	0.20	0.0046	0.0016	0.0181	0.0024	0.0152	0.0074	10.50	2.50	6.11	1.65	3.4	0.3
AB-2	04/21	1	590	650	0.17	0.04	1.80	0.20	-0.0008	0.0009	0.0491	0.0063	0.0098	0.0032	8.07	2.02	4.79	1.39	3.3	0.3
AB-3	04/15	1	230	610	0.42	0.05	1.46	0.05	0.0192	0.0028	1.0830	0.0380	0.2536	0.0136	8.45	2.10	6.38	1.71	9.2	0.9
AB-4	04/21	1	160	610	0.17	0.03	1.08	0.06	0.0004	0.0007	0.0082	0.0014	0.0145	0.0075	8.82	2.17	5.45	1.53	3.0	0.3
AB-4A	04/21	1	300	620	0.41	0.06	1.60	0.10	-0.0002	0.0007	0.0172	0.0026	0.0138	0.0075	10.40	2.47	5.89	1.61	3.2	0.3
AB-5	04/21	1	590	650	0.90	0.11	1.45	0.09	0.0018	0.0012	0.0268	0.0026	0.0206	0.0078	7.12	1.84	5.17	1.47	3.4	0.3
AB-6	04/21	1	330	630	0.20	0.04	0.84	0.04	0.0037	0.0016	0.0106	0.0023	0.0030	0.0016	5.01	1.42	3.43	1.11	2.9	0.3
AB-7	04/21	1	470	640	0.53	0.07	4.80	0.20	0.0008	0.0008	0.0103	0.0018	0.0072	0.0072	5.45	1.51	5.36	1.51	3.2	0.3
AB-8	04/21	1	190	620	0.11	0.04	1.77	0.09	0.0007	0.0005	0.0042	0.0010	0.0139	0.0075	6.05	1.63	3.76	1.18	2.8	0.3

Table 5-23. Radiochemical Analysis of Sediments for 1999 (pCi/g[a]) (Cont.)

Station Name	Date	Code	^{3}H (pCi/L)		^{137}Cs		U (mg/kg)		^{238}Pu		$^{239, 240}$Pu		^{241}Am		Gross Alpha		Gross Beta		Gross Gamma	
Regional Stations (Cont.)																				
TA-49, Area AB: (Cont.)																				
AB-9	04/21	1	380	630	0.21	0.04	0.92	0.05	0.0007	0.0010	0.0077	0.0013	-0.0005	0.0064	4.07	1.22	3.20	1.07	2.8	0.3
AB-9	04/21	2	420	630	0.27	0.05	0.14	0.01	0.0022	0.0011	0.0194	0.0032	0.0041	0.0016	4.89	1.39	3.56	1.14	2.7	0.3
AB-10	04/21	1	380	630	0.25	0.05	0.38	0.02	0.0037	0.0010	0.0092	0.0014	0.0157	0.0069	4.53	1.32	3.57	1.14	2.7	0.3
AB-11	04/21	1	180	620	0.15	0.04	0.36	0.02	0.0020	0.0012	0.0030	0.0014	0.0019	0.0010	3.76	1.16	3.62	1.15	2.7	0.3
Frijoles Canyon:																				
Frijoles at Monument HQ	12/21	1	40	700	0.09	0.05	0.26	0.01	0.0029	0.0008	0.0046	0.0011	0.0030	0.0010	3.62	1.13	3.38	1.07	2.6	0.3
Frijoles at Rio Grande	12/21	1	-210	680	0.09	0.03	1.10	0.10	0.0012	0.0005	0.0019	0.0007	0.0009	0.0005	3.92	1.19	2.90	0.96	2.6	0.3
White Rock, Cañada del Buey:																				
Site #1 Bonnie View	10/28	2	360	620	0.31	0.06	0.47	0.03	0.0020	0.0011	0.0142	0.0023	0.0039	0.0013	4.98	1.41	3.62	1.19	3.5	0.3
Site #1 Bonnie View	10/28	1	550	640	0.17	0.03	1.08	0.06	0.0039	0.0011	0.0075	0.0014	0.0132	0.0021	3.46	1.10	2.76	1.01	3.5	0.4
Site #1 Bonnie View	10/28	3	730	650	0.01	0.01	0.23	0.02	0.0004	0.0008	0.0041	0.0010	0.0030	0.0009	1.62	0.68	1.48	0.75	2.1	0.2
Site #2 Rover	10/28	3	300	620	0.11	0.03	0.63	0.03	0.0015	0.0006	0.0146	0.0019	0.0020	0.0010	3.76	1.16	2.59	0.98	3.5	0.3
Site #2 Rover	10/28	2	360	620	0.14	0.03	0.99	0.04	0.0009	0.0012	0.0097	0.0027	0.0062	0.0020	3.92	1.19	2.68	1.00	3.1	0.3
Site #2 Rover	10/28	1	440	630	0.05	0.04	0.33	0.02	0.0004	0.0007	0.0037	0.0014	0.0022	0.0009	2.31	0.84	1.46	0.75	2.7	0.3
Site #2 Rover	10/28	4	810	660	0.01	0.03	0.85	0.04	0.0011	0.0006	0.0472	0.0032	0.0132	0.0023	2.01	0.77	1.58	0.77	1.8	0.2
Site #3 Lejano	10/28	3	350	620	0.05	0.04	0.92	0.07	0.0004	0.0004	0.0042	0.0010	0.0065	0.0014	2.33	0.85	1.80	0.82	2.3	0.2
Site #3 Lejano	10/28	2	390	630	0.10	0.02	1.40	0.10	0.0020	0.0007	0.0058	0.0012	0.0013	0.0006	3.92	1.19	2.85	1.03	3.5	0.3
Site #3 Lejano	10/28	1	260	620	0.12	0.03	0.97	0.03	0.0023	0.0008	0.0055	0.0011	0.0018	0.0007	4.65	1.34	3.10	1.08	3.8	0.4
Site #4 Meadow Lane	10/28	5	370	620	-0.01	0.14	0.52	0.03	0.0045	0.0012	0.0084	0.0016	-0.0006	0.0023	2.96	0.99	1.98	0.85	2.7	0.3
Site #4 Meadow Lane	10/28	2	330	620	0.04	0.04	0.48	0.02	0.0016	0.0009	0.0048	0.0010	0.0012	0.0005	3.86	1.18	3.44	1.15	3.7	0.4
Site #4 Meadow Lane	10/28	1	740	650	0.09	0.03	0.64	0.02	0.0012	0.0008	0.0064	0.0013	0.0037	0.0011	3.49	1.10	2.74	1.01	3.9	0.4
Site #4 Meadow Lane	10/28	3	100	610	0.16	0.03	1.00	0.10	0.0031	0.0009	0.0078	0.0014	0.0007	0.0005	3.92	1.19	2.91	1.04	3.1	0.3
Site #5 Overlook Park	10/28	3	350	620	0.16	0.04	0.84	0.06	0.0042	0.0011	0.7472	0.0262	0.0048	0.0017	4.34	1.28	2.52	0.96	3.2	0.3
Site #5 Overlook Park	10/28	5	-240	580	0.07	0.04	0.12	0.02	0.0001	0.0004	0.0042	0.0011	0.0067	0.0018	1.29	0.59	1.52	0.76	2.8	0.3
Site #5 Overlook Park	10/28	4	220	610	0.19	0.04	1.18	0.03	0.0005	0.0005	0.0131	0.0017	0.0044	0.0018	4.01	1.21	3.10	1.08	3.2	0.3
Site #5 Overlook Park	10/28	2	390	630	0.10	0.04	0.71	0.07	0.0054	0.0017	0.0101	0.0021	0.0009	0.0005	3.40	1.08	2.72	1.00	3.8	0.4
Site #5 Overlook Park	10/28	1	230	620	-0.01	0.22	0.38	0.03	0.0007	0.0005	0.0032	0.0011	0.0034	0.0012	2.83	0.96	2.44	0.95	3.1	0.3
Site #5 Overlook Park	10/28	6	-50	590	0.06	0.04	0.68	0.04	0.0029	0.0009	0.0068	0.0012	0.0079	0.0017	2.20	0.82	1.66	0.79	2.4	0.2
Special EPA Sampling																				
Ancho Canyon 1	12/16	1	770	670	0.33	0.04	5.80	0.20	0.0186	0.0019	0.0159	0.0018			12.80	2.93	8.77	2.16	4.9	0.5
Ancho Canyon 2	12/16	1	760	670	0.31	0.05	2.61	0.04	0.0015	0.0005	0.0131	0.0016			6.43	1.70	4.78	1.37	3.5	0.3
Ancho Canyon 3	12/16	1	340	640	0.32	0.05	2.12	0.05	0.0071	0.0013	0.0207	0.0023			8.59	2.12	6.16	1.65	4.0	0.4
Ancho Canyon 4	12/16	1	990	680	0.22	0.03	2.00	0.05	0.0010	0.0005	0.0172	0.0020			7.23	1.86	4.84	1.38	3.1	0.3
Ancho Canyon 5	12/16	1	670	660	0.09	0.03	0.81	0.04	0.0003	0.0004	0.0063	0.0013			4.42	1.29	3.10	1.02	2.9	0.3
Bayo Canyon 1	12/13	1	0	690	0.63	0.08	1.70	0.10	0.0010	0.0006	0.0458	0.0035	0.0193	0.0028	3.07	1.01	3.67	1.12	7.0	0.7
Bayo Canyon 2	12/13	1	40	700	0.27	0.04	1.33	0.06	0.0003	0.0006	0.0177	0.0020	0.0003	0.0003	3.60	1.13	3.90	1.17	7.0	0.7
Bayo Canyon 3	12/13	1	-10	690	0.20	0.03	0.97	0.04	0.0002	0.0005	0.0100	0.0015	0.0037	0.0014	3.27	1.06	2.86	0.94	7.6	0.8
Bayo Canyon 4	12/13	1	350	720	0.27	0.04	1.00	0.10	0.0026	0.0012	0.0158	0.0024	0.0021	0.0008	3.00	1.00	2.76	0.92	8.9	0.9

Table 5-23. Radiochemical Analysis of Sediments for 1999 (pCi/g[a]) (Cont.)

Station Name	Date	Code	^{3}H (pCi/L)		^{137}Cs		U (mg/kg)		^{238}Pu		$^{239, 240}$Pu		^{241}Am		Gross Alpha		Gross Beta		Gross Gamma	
Special EPA Sampling (Cont.)																				
Cañada del Buey 1	12/15	1	300	630	0.07	0.02	0.79	0.02	0.0012	0.0006	0.0037	0.0010			4.87	1.38	3.14	1.05	3.0	0.3
Cañada del Buey 2	12/15	1	290	630	0.13	0.03	0.74	0.03	0.0023	0.0009	0.0047	0.0012			6.13	1.64	3.34	1.10	3.0	0.3
Cañada del Buey 3	12/16	1	-140	680	0.06	0.03	0.54	0.03	0.0060	0.0016	0.0089	0.0020	0.0088	0.0018	4.14	1.24	2.64	0.91	2.7	0.3
Cañada del Buey 4	12/15	1	270	630	0.05	0.02	1.47	0.05	0.0019	0.0006	0.0057	0.0011			4.92	1.39	3.25	1.08	3.9	0.4
Cañada del Buey 4	12/15	2	340	640	0.04	0.02	0.70	0.04	0.0005	0.0003	0.0030	0.0007			4.94	1.40	3.36	1.10	3.7	0.4
Cañada del Buey 5A	12/15	1	130	620	0.05	0.02	0.74	0.07	0.0011	0.0006	0.0046	0.0009			4.83	1.37	3.40	1.11	4.0	0.4
Cañada del Buey 5B	12/16	1	-90	690	0.16	0.04	0.42	0.03	0.0022	0.0009	0.0036	0.0011	0.0025	0.0008	5.99	1.61	3.75	1.15	3.6	0.4
Cañada del Buey 6	12/15	1	300	630	0.08	0.02	0.74	0.07	0.0021	0.0009	0.0159	0.0023			5.63	1.54	3.42	1.11	3.7	0.4
Cañada del Buey 7	12/15	1	300	630	0.11	0.03	0.30	0.02	0.0019	0.0006	0.0072	0.0012			5.43	1.50	3.04	1.03	3.7	0.4
Cañada del Buey 8	12/15	1	150	620	0.09	0.03	0.81	0.06	0.0010	0.0008	0.0044	0.0012			5.27	1.46	3.24	1.07	3.9	0.4
Mortandad Canyon 1	12/14	1	120	700	0.14	0.04	0.77	0.02	0.0005	0.0004	0.0118	0.0016			6.34	1.68	4.52	1.34	4.6	0.5
Mortandad Canyon 2	12/14	1	190	710	0.15	0.03	0.60	0.04	0.0009	0.0005	0.0512	0.0033			4.18	1.24	3.38	1.10	5.4	0.5
Mortandad Canyon 3	12/14	1	60	700	0.00	0.22	0.83	0.05	0.0004	0.0004	0.0086	0.0013			3.03	0.99	2.11	0.83	3.6	0.4
Mortandad Canyon 4	12/14	1	900	750	0.31	0.05	0.38	0.02	0.0007	0.0004	0.0575	0.0041			4.63	1.33	3.65	1.16	3.6	0.4
Mortandad Canyon 5A	12/14	1	100	700	0.08	0.04	0.90	0.10	0.0011	0.0013	0.0152	0.0027			5.44	1.50	2.98	1.02	3.1	0.3
Mortandad Canyon 5B	12/14	1	-60	690	0.05	0.04	0.52	0.03	0.0005	0.0003	0.0021	0.0007			2.54	0.88	1.58	0.71	4.5	0.5
Pajarito Canyon 1	12/16	1	460	650	0.40	0.05	1.24	0.06	0.0046	0.0009	0.0191	0.0018			6.54	1.72	4.30	1.27	5.9	0.6
Pajarito Canyon 2	12/16	1	400	640	0.11	0.03	0.82	0.05	0.0036	0.0009	0.0162	0.0018			5.53	1.52	3.41	1.08	5.1	0.5
Pajarito Canyon 3	12/16	1	160	620	0.37	0.05	1.34	0.06	0.0097	0.0017	0.0119	0.0020			6.22	1.66	5.26	1.47	5.1	0.5
Pajarito Canyon 4	12/16	1	470	650	0.35	0.05	1.05	0.04	0.0011	0.0005	0.0137	0.0017			8.67	2.14	5.54	1.52	5.0	0.5
Sandia Canyon 1	12/13	1	60	700	0.00	0.26	0.65	0.03	0.0013	0.0006	0.0016	0.0006	0.0003	0.0003	3.52	1.11	1.89	0.71	3.5	0.4
Sandia Canyon 2	12/13	1	110	700	0.10	0.04	0.53	0.01	0.0002	0.0003	0.0050	0.0010	0.0013	0.0005	5.58	1.53	3.58	1.10	3.8	0.4
Sandia Canyon 3	12/13	1	3,190	880	0.10	0.04	1.12	0.06	0.0027	0.0009	0.0051	0.0012	0.0014	0.0006	3.22	1.05	2.32	0.82	3.6	0.4
Sandia Canyon 4	12/13	1	80	700	0.05	0.05	1.17	0.07	0.0061	0.0013	0.0095	0.0016	0.0158	0.0022	2.75	0.94	1.91	0.72	4.3	0.4
Sandia Canyon 5	12/13	1	470	720	0.56	0.09	1.64	0.07	0.0014	0.0006	0.0337	0.0027	0.0152	0.0022	3.94	1.20	2.98	0.97	4.6	0.5
Sandia Canyon 6	12/13	1	330	710	0.09	0.03	1.54	0.06	0.0047	0.0015	0.0113	0.0023	0.0743	0.0066	3.30	1.06	2.73	0.91	7.0	0.7
Standardized Comparisons																				
Average Detection Limits			700		0.05		0.25		0.0050[b]		0.0050[b]		0.0050		1.50		1.50		0.8	
Background					0.44[d]		4.4[d]		0.006[c]		0.023[c]		0.09[d]		14.8[d]		12[d]		8.2[d]	
SAL[e]			20,000		4.40		29.00		27.0000		24.0000		22.0000							

[a] Except where noted. Two columns are listed; the first is the value, the second is the counting uncertainty (1 std. dev.).
[b] Sample sizes for plutonium-238 and -239, -240 analysis: stream channels–100 g; reservoirs–1,000 g. Limits of detection for plutonium-238 and -239, -240 in reservoir samples are 0.0001 pCi/g.
[c] Purtymun et al. (1987a), upper limit for background for sediment samples from 1974–1986.
[d] Preliminary upper limit for background values for channel sediments from 1974–1996.
[e] Screening Action Level, LANL Environmental Restoration Project, 1998.

Table 5-24. Total Recoverable Trace Metals in Sediments for 2000 (mg/kg)

Station Name	Date	Code	Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe
Regional Stations													
Rio Chama at Chamita (bank)	07/12	CS	<[a] 0.5	2,211	0.5	< 1	49.9	0.3	< 0.2	1.1	2.7	1.4	3,512
Rio Chama at Chamita (bank)	07/12	CS	< 0.8	3,123	0.7	< 1	62.5	0.3	< 0.2	1.6	3.7	2.4	4,463
Rio Grande at Embudo (bank)	07/12	CS	9.1	5,562	2.2	< 1	98.5	0.4	< 0.2	4.9	9.7	8.4	10,798
Rio Grande at Otowi (bank)	06/27	CS	< 0.4	849	< 0.4	< 2	24.0	0.3	< 0.7	1.5	4.2	3.6	4,823
Rio Grande at Otowi (bank)	06/27	CS	< 0.4	1,062	0.5	2	21.5	0.3	< 0.5	1.4	3.9	3.7	4,384
Rio Grande at Otowi Upper (bank)	06/27	CS	< 0.4	5,585	1.0	< 2	104.3	0.6	< 0.2	3.5	8.7	4.8	9,282
Rio Grande at Bernalillo	07/11	CS	< 1.1	7,323	2.5	< 1	141.7	0.4	< 0.2	4.9	7.8	6.4	10,590
Jemez River	07/13	CS	< 0.4	2,544	4.0	< 1	41.8	0.3	< 0.2	1.5	4.0	1.5	4,320
Pajarito Plateau Stations													
Guaje Canyon:													
Guaje at SR-502	06/27	CS	< 0.4	4,958	0.9	< 4	100.2	0.6	< 0.2	2.8	4.5	8.8	5,534
Guaje at SR-502	06/27	CS	15.8	4,468	0.7	< 2	89.6	0.5	< 0.2	2.8	4.0	7.0	5,138
Bayo Canyon:													
Bayo at SR-502	06/27	CS	< 0.4	3,344	< 0.6	< 2	86.9	0.4	< 0.2	3.2	5.1	4.7	6,584
DP/Los Alamos Canyons:													
Los Alamos at Totavi	06/27	CS	< 0.6	5,207	1.1	< 2	95.2	0.6	< 0.2	3.9	5.9	6.5	7,535
Los Alamos at Otowi	06/27	CS	< 0.4	9,010	1.2	3	123.8	0.8	0.2	3.9	8.2	7.6	9,396
Mortandad Canyon:													
Mortandad at MCO-5	03/28	CS	< 1.0	1,834	1.1	< 1	18.3	0.2	< 0.2	2.6	2.0	0.6	3,597
Cañon de Valle:													
Cañon de Valle at SR-501	03/29	CS	< 1.0	6,182	1.0	< 1	80.7	0.5	0.3	2.7	6.6	4.9	7,436
Water Canyon:													
Water at SR-501	03/29	CS	< 1.0	5,034	1.3	< 1	35.0	0.8	< 0.9	2.2	4.9	5.6	14,458
Frijoles Canyon:													
Frijoles at Monument Headquarters	08/22	CS	< 101.0	1,770	0.7	< 410	27.8	0.2	0.1	0.7	1.1	1.7	2,150
Frijoles at Monument Headquarters	08/22	DUP	< 101.0	2,020	0.7	< 410	32.0	0.3	< 38.2	0.7	1.4	1.7	2,450
Frijoles at Monument Headquarters	08/22	CS	< 101.0	973	0.4	< 410	14.0	0.1	< 38.2	0.3	0.7	0.7	1,590
Frijoles at Rio Grande	08/22	CS	< 101.0	13,600	4.7	7	347.0	1.6	0.4	8.0	9.5	22.3	12,900

Table 5-24. Total Recoverable Trace Metals in Sediments for 2000 (mg/kg) (Cont.)

Station Name	Date	Code	Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe
Pajarito Plateau Stations (Cont.)													
TA-54 Area G:													
G-0	04/19	CS	< 0.4	5,227	0.6	< 1	44.4	0.4	< 0.4	2.1	4.6	3.1	7,729
G-0	04/19	CS	< 0.4	1,596	0.7	< 1	27.6	0.1	< 0.2	1.3	1.7	1.7	2,423
G-1	04/19	CS	< 0.4	385	0.3	< 1	19.7	0.1	< 0.2	0.8	< 0.5	< 0.4	271
G-1	04/19	CS	< 0.4	3,198	0.9	< 1	31.4	0.3	< 0.2	1.9	3.1	1.2	5,766
G-2	04/19	CS	< 0.4	2,504	< 0.9	< 1	25.3	0.3	< 0.2	< 1.5	2.5	1.3	4,085
G-3	04/19	CS	< 0.4	4,830	1.4	< 1	75.0	0.5	< 0.2	2.9	4.0	3.4	6,801
G-4 R-1	04/19	CS	24.3	4,978	1.5	< 1	52.0	0.5	< 0.2	2.6	4.9	3.1	6,390
G-4 R-2	04/19	CS	< 0.4	3,901	1.3	1	45.8	0.5	< 0.2	1.7	3.7	3.3	5,079
G-5	04/19	CS	< 0.4	9,105	2.1	< 1	71.0	0.6	< 0.2	3.3	9.8	5.2	10,004
G-7	04/19	CS	< 0.4	5,998	1.3	< 1	38.5	0.4	< 0.2	2.2	4.4	2.1	7,253
G-8	04/19	CS	14.0	6,950	1.8	< 1	87.0	0.6	< 0.2	5.0	8.6	2.6	11,937
G-9	04/19	CS	< 0.4	3,319	1.1	< 1	43.3	0.4	< 0.2	2.3	2.9	1.7	4,538
G-6 R	04/24	CS	< 0.4	3,329	0.7	< 1	53.7	0.7	0.7	2.3	3.5	7.6	4,809
TA-49 Area AB:													
AB-1	04/25	CS	40.1	5,130	1.4	48	107.1	49.2	47.7	50.5	53.1	55.0	6,158
AB-1	04/25	CS	< 0.4	11,371	1.9	< 1	135.2	1.2	0.5	5.7	8.0	6.3	11,801
AB-2	04/25	CS	1.9	4,879	1.5	< 1	88.4	0.6	< 0.2	3.6	3.6	4.0	6,072
AB-3	04/05	CS	< 1.6	12,231	1.8	< 1	81.8	0.8	< 0.4	3.1	8.1	4.8	8,087
AB-4	04/05	CS	< 1.6	15,102	2.6	< 1	156.8	1.1	< 0.2	4.6	7.6	4.6	9,887
AB-4A	04/05	CS	< 1.6	5,290	1.0	< 1	71.9	0.5	< 0.2	2.1	3.5	3.1	4,580
AB-5	04/05	CS	< 1.6	685	1.6	< 1	5.5	< 0.1	< 0.2	< 0.4	0.6	0.4	869
AB-6	04/05	CS	< 1.6	3,730	1.3	< 1	54.7	0.4	< 0.2	2.9	4.4	2.4	5,592
AB-7	04/05	CS	< 1.6	4,744	1.8	< 1	44.6	0.5	< 0.2	1.9	4.4	2.1	8,461
AB-8	04/05	CS	< 1.6	2,658	1.4	< 1	55.2	0.4	< 0.2	2.7	3.3	2.4	4,335
AB-9	04/05	CS	< 1.6	5,521	0.7	< 1	65.2	0.5	< 0.5	1.8	3.1	2.4	4,517
AB-10	04/05	CS	< 1.6	5,697	1.5	< 1	67.0	0.5	< 0.2	3.0	4.2	4.1	6,291
AB-11	04/05	CS	< 1.6	3,260	0.7	< 1	45.3	0.4	< 0.4	1.5	2.3	2.7	2,962
AB-11	04/05	CS	< 1.6	5,685	1.3	< 1	69.3	0.6	0.3	2.0	3.7	4.1	5,543
SAL[b]			380	78,000	19	5,900	270		38	4,600	30[c]	28,000	

Table 5-24. Total Recoverable Trace Metals in Sediments for 2000 (mg/kg) (Cont.)

Station Name	Date	Code	Hg	Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn
Regional Stations														
Rio Chama at Chamita (bank)	07/12	CS	< 0.010	77	< 1.0	< 2.0	2.8	< 0.04	< 2.0	< 4	23.6		6.0	9.7
Rio Chama at Chamita (bank)	07/12	CS	< 0.010	92	< 1.0	3.2	3.4	< 0.04	2.0	< 4	29.9		8.9	12.5
Rio Grande at Embudo (bank)	07/12	CS	0.016	228	< 1.0	8.8	10.5	< 0.04	< 2.0	< 4	41.0		17.0	69.1
Rio Grande at Otowi (bank)	06/27	CS	< 0.010	56	< 1.0	< 2.0	2.4	< 0.04	0.6	< 4	7.7		12.1	12.3
Rio Grande at Otowi (bank)	06/27	CS	< 0.010	53	< 1.0	< 2.0	3.0	< 0.08	0.6	< 4	7.4		10.1	13.1
Rio Grande at Otowi Upper (bank)	06/27	CS	< 0.010	184	< 1.0	< 2.0	3.0	< 0.08	0.9	< 4	55.2		17.2	23.0
Rio Grande at Bernalillo	07/11	CS	0.011	272	< 1.0	6.5	8.4	< 0.04	< 3.0	< 4	73.2		14.8	28.4
Jemez River	07/13	CS	< 0.010	334	< 1.0	< 4.4	5.2	< 0.04	0.7	< 4	62.5		5.9	13.2
Pajarito Plateau Stations														
Guaje Canyon:														
Guaje at SR-502	06/27	CS	< 0.010	382	< 1.0	2.7	17.0	< 0.08	0.6	< 4	31.2		8.0	43.2
Guaje at SR-502	06/27	CS	< 0.010	325	< 1.0	< 2.0	14.0	< 0.08	0.5	< 4	25.7		7.2	32.8
Bayo Canyon:														
Bayo at SR-502	06/27	CS	< 0.010	236	< 1.0	6.7	4.6	< 0.04	0.4	< 4	19.9		11.5	36.6
DP/Los Alamos Canyons:														
Los Alamos at Totavi	06/27	CS	< 0.010	296	< 1.0	< 7.3	11.0	< 0.08	0.7	< 4	26.0		11.2	34.6
Los Alamos at Otowi	06/27	CS	0.012	395	< 1.0	5.0	12.0	< 0.08	1.1	< 4	37.0		15.4	39.2
Mortandad Canyon:														
Mortandad at MCO-5	03/28	CS	0.012	156	< 1.0	< 2.9	4.9	< 0.04	< 0.2	< 4	3.2		6.4	11.1
Cañon de Valle:														
Cañon de Valle at SR-501	03/29	CS	0.026	498	< 1.0	< 3.5	10.8	< 0.04	0.5	< 4	23.2		9.8	40.1
Water Canyon:														
Water at SR-501	03/29	CS	< 0.010	420	< 3.6	< 5.8	13.4	< 0.04	< 0.5	< 4	5.6		10.9	88.7
Frijoles Canyon:														
Frijoles at Monument Headquarters	08/22	CS	0.005	150	0.2	1.2	5.0	< 0.18	0.2	1	6.9	0.09	2.5	13.2
Frijoles at Monument Headquarters	08/22	DUP	0.008	135	0.2	1.3	4.2	< 89.30	0.3	1	6.6	0.04	2.6	14.1
Frijoles at Monument Headquarters	08/22	CS	< 15.200	107	0.2	0.6	2.1	< 0.23	< 146.0	1	2.9	0.03	1.5	9.3
Frijoles at Rio Grande	08/22	CS	0.031	1,490	0.4	13.5	39.4	< 0.31	1.4	2	101.0	0.26	19.9	72.7

Table 5-24. Total Recoverable Trace Metals in Sediments for 2000 (mg/kg) (Cont.)

Station Name	Date	Code	Hg	Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn
Pajarito Plateau Stations (Cont.)														
TA-54 Area G:														
G-0	04/19	CS	< 0.010	192	< 1.0	4.6	3.0	< 0.08	< 0.1	< 4	14.4		9.6	44.2
G-0	04/19	CS	< 0.010	98	< 1.0	3.3	4.0	< 0.08	0.2	< 4	6.2		2.5	23.4
G-1	04/19	CS	< 0.010	74	< 1.0	< 2.0	4.0	< 0.08	< 0.2	< 4	3.3		1.1	4.0
G-1	04/19	CS	< 0.010	182	< 1.0	< 4.1	6.0	< 0.08	< 0.1	< 4	5.4		6.8	31.6
G-2	04/19	CS	< 0.010	127	< 1.0	2.8	6.0	< 0.08	< 0.3	< 4	5.3		4.4	21.3
G-3	04/19	CS	< 0.010	293	< 1.0	3.7	12.0	< 0.08	< 0.3	< 4	11.8		7.4	62.9
G-4 R-1	04/19	CS	0.018	233	< 1.0	< 3.8	10.0	< 0.08	< 0.3	< 4	9.7		7.0	33.7
G-4 R-2	04/19	CS	0.016	189	< 1.0	< 4.0	9.0	< 0.08	< 0.2	< 4	9.0		5.9	32.6
G-5	04/19	CS	0.016	253	< 1.0	< 5.7	9.0	< 0.08	< 0.3	< 4	16.2		15.2	43.6
G-7	04/19	CS	< 0.010	209	< 1.0	2.7	8.0	< 0.08	< 1.0	< 4	7.5		9.0	35.8
G-8	04/19	CS	< 0.010	324	< 1.0	5.9	9.0	< 0.08	< 0.2	< 4	11.9		21.0	32.1
G-9	04/19	CS	< 0.010	193	< 1.0	3.8	8.0	< 0.08	< 0.1	< 4	6.9		5.4	22.6
G-6 R	04/24	CS	< 0.010	173	< 1.0	< 3.8	6.3	< 0.04	0.4	< 4	17.6		7.5	42.8
TA-49 Area AB:														
AB-1	04/25	CS	0.020	237	49.2	50.2	15.2	< 0.04	0.7	47	63.5		55.4	89.4
AB-1	04/25	CS	0.024	406	< 1.0	5.4	13.3	< 0.04	0.7	< 4	24.6		15.1	472.7
AB-2	04/25	CS	0.023	279	< 1.0	4.4	14.2	< 0.04	0.6	< 4	16.2		6.4	344.4
AB-3	04/05	CS	0.012	177	< 1.0	5.2	8.6	< 0.04	0.3	< 4	15.8		12.5	35.8
AB-4	04/05	CS	0.015	393	< 1.0	5.5	15.0	< 0.04	0.5	< 4	24.5		10.8	25.1
AB-4A	04/05	CS	0.011	153	< 1.0	< 3.3	7.8	< 0.04	< 0.3	< 4	11.8		5.8	15.6
AB-5	04/05	CS	0.016	23	< 1.0	< 2.0	11.1	< 0.04	< 0.2	< 4	1.0		1.1	3.3
AB-6	04/05	CS	< 0.010	210	< 1.0	< 2.0	7.6	< 0.04	< 0.2	< 4	8.5		9.1	15.0
AB-7	04/05	CS	< 0.010	178	< 1.0	2.7	12.0	< 0.04	< 0.3	< 4	8.0		6.8	35.5
AB-8	04/05	CS	0.011	228	< 1.0	< 5.3	10.5	< 0.04	< 0.2	< 4	9.0		4.9	19.2
AB-9	04/05	CS	< 0.010	147	< 1.0	< 2.0	6.2	< 0.04	< 0.4	< 4	10.6		4.1	17.8
AB-10	04/05	CS	< 0.010	218	< 1.0	< 2.0	8.1	< 0.04	< 0.2	< 4	10.5		8.0	18.9
AB-11	04/05	CS	0.014	111	< 1.0	< 2.0	4.6	< 0.04	< 0.2	< 4	8.0		3.2	14.5
AB-11	04/05	CS	< 0.010	164	< 1.0	< 2.0	10.4	< 0.04	< 0.2	< 4	13.0		5.8	18.7
SAL[b]			23	390	380	1,500	400	31	380		46,000	6	540	23,000

[a]Less than symbol (<) means measurement was below the specified limit of detection of the analytical method.
[b]Screening Action Level (Environmental Restoration Project 1997); see text for details.
[c]SAL value for hexavalent chromium is listed; SAL value for trivalent or total chromium is 210 mg/kg.

Table 5-25. Number of Samples Collected for Each Suite of Organic Compounds in Sediments for 2000

		Organic Suite[a]		
Station Name	**Date**	**HE**	**PCB**	**Semivolatile**
AB-1	04/25		2	2
AB-10	04/05		1	1
AB-11	04/05		2	2
AB-2	04/25		1	1
AB-3	04/05		1	1
AB-4	04/05		1	1
AB-4A	04/05		1	1
AB-5	04/05		1	1
AB-6	04/05		1	1
AB-7	04/05		1	1
AB-8	04/05		1	1
AB-9	04/05		1	1
Above Ancho Spring	09/26	1		
Ancho at SR-4	03/28		1	1
Frijoles at Monument Headquarters	08/22		2	2
Pajarito at Rio Grande	09/26	1	1	1
Pajarito at SR-4	03/28	1		
Water at Rio Grande	09/26	1	1	1

[a] High explosives, polychlorinated biphenyls, semivolatiles, and volatiles.

Table 5-26. Organic Compounds Detected in Sediment Samples in 2000

Station Name	Date	Suite[a]	Analyte	Result	MDL	Units	ER SAL	EPA Residential Soil Screening Level	Results/ Screening Level	Lab Code
Ancho at SR-4	03/28	SVOA	Pyrene	0.44		mg/kg	2,400	2,300	0.00	PARA
Ancho at SR-4	03/28	SVOA	Benzo(g,h,i)perylene	0.11		mg/kg				PARA
Ancho at SR-4	03/28	SVOA	Benzo(b)fluoranthene	0.30		mg/kg	1	0.62	0.48	PARA
Ancho at SR-4	03/28	SVOA	Fluoranthene	0.52		mg/kg	3,200	2,300	0.00	PARA
Ancho at SR-4	03/28	SVOA	Chrysene	0.24		mg/kg	96	62	0.00	PARA
Ancho at SR-4	03/28	SVOA	Benzo(a)pyrene	0.23		mg/kg	0.1	0.62	0.37	PARA
Ancho at SR-4	03/28	SVOA	Benzo(a)anthracene	0.25		mg/kg	1	0.62	0.40	PARA
Ancho at SR-4	03/28	SVOA	Phenanthrene	0.21		mg/kg				PARA
AB-11	04/05	SVOA	Bis(2-ethylhexyl)phthalate	0.25		mg/kg	50	35	0.01	PARA
AB-8	04/05	SVOA	Benzo(g,h,i)perylene	0.18		mg/kg				PARA
AB-1	04/25	SVOA	Benzo(g,h,i)perylene	0.34		mg/kg				PARA
AB-1	04/25	SVOA	Benzo(g,h,i)perylene	0.22		mg/kg				PARA
AB-1	04/25	SVOA	Chrysene	0.14		mg/kg	96	62	0.00	PARA
Pajarito at Rio Grande	09/26	SVOA	Bis(2-ethylhexyl)phthalate	0.29	0.020	mg/kg	50	35	0.01	GELC

[a] SVOA–semivolatile organics.

Table 5-27. Radiochemical Analysis of Groundwater for 2000 (pCi/L[a])

Station Name	Date	Codes[b]		^{3}H			^{90}Sr			^{137}Cs				^{234}U			$^{235,236}U$			^{238}U			U (µg/L, lab)
Regional Aquifer Wells																							
Test Wells:																							
Test Well 1	05/02	UF	CS	170	460		0.04	0.03	0.10		-0.43	2.08		1.947	0.096		0.047	0.016		1.097	0.066		
Test Well 2	05/03	UF	CS	60	440		0.03	0.03	0.10		0.32	1.21		0.032	0.016		-0.012	0.004		0.026	0.013		
Test Well 3	05/03	UF	CS	-40	430		0.03	0.03	0.10		0.00	4.49		0.340	0.039		-0.004	0.007		0.180	0.026		
Test Well 3	05/03	UF	CS	20	440		0.04	0.03	0.10		0.00	5.40		0.551	0.045		0.002	0.008		0.210	0.028		
Test Well 4	05/02	UF	CS	20	440		0.01	0.03	0.10		0.15	0.73		0.065	0.018		0.001	0.007		0.022	0.013		
Test Well 8	05/02	UF	CS	60	440		0.04	0.03	0.10		0.00	4.25		0.418	0.047		0.009	0.012		0.229	0.034		
Test Well DT-5A	10/26	UF	CS	-178	55	201	-0.03	0.12	0.44	<	0.00	0.90	3.84	0.159	0.033	0.017	-0.003	0.008	0.066	0.119	0.029	0.045	
Test Well DT-5A	10/26	UF	DUP																				
Test Well DT-5A	10/26	UF	CS	-176	54	198	-0.01	0.12	0.43	<	-0.80	1.07	3.54	0.319	0.051	0.057	0.000	1.000	0.017	0.095	0.027	0.066	
Test Well DT-10	10/27	UF	CS	-180	56	203	-0.02	0.10	0.37	<	0.30	1.11	3.31	0.535	0.073	0.073	0.030	0.016	0.050	0.162	0.036	0.063	
Test Well DT-10	10/27	UF	DUP							<	1.70	1.22	2.89										
Water Supply Wells:																							
O-1	06/21	UF	CS											0.877	0.059		0.016	0.013		0.559	0.045		
O-1	08/14	UF	CS	-60	390						0.00	11.14		0.808	0.057		0.020	0.011		0.419	0.038		
O-1	08/14	UF	CS	-60	390						-0.27	1.71		0.854	0.059		0.016	0.012		0.482	0.041		
O-4	06/21	UF	CS											0.578	0.050		0.011	0.010		0.252	0.029		
O-4	08/14	UF	CS	-60	390						0.00	8.66		0.474	0.043		0.033	0.016		0.264	0.031		
PM-1	02/14	UF	CS				0.01	0.03						1.280	0.125		0.017	0.013		0.600	0.070		
PM-1	06/20	UF	CS											1.309	0.076		0.027	0.014		0.581	0.047		
PM-1	08/14	UF	CS	30	400						0.13	0.84		1.329	0.072		0.035	0.014		0.583	0.044		
PM-1	08/14	UF	CS	30	400						0.00	8.64		0.221	0.032		-0.007	0.010		0.112	0.020		
PM-2	02/14	UF	CS				0.00	0.04						0.174	0.035		-0.002	0.010		0.096	0.025		
PM-2	06/20	UF	CS											0.213	0.029		0.009	0.009		0.105	0.019		
PM-2	08/14	UF	CS	-150	380		-0.07	0.21	0.37		-2.01	4.06		0.169	0.030		0.005	0.008		0.108	0.020		
PM-3	06/21	UF	CS											0.729	0.053		0.002	0.009		0.295	0.031		
PM-3	08/14	UF	CS	30	400		0.09	0.23	0.39		-0.32	2.80		0.663	0.052		0.002	0.007		0.320	0.034		
PM-4	06/21	UF	CS											0.260	0.031		0.012	0.010		0.117	0.020		
PM-4	08/14	UF	CS	-150	380		0.09	0.23	0.39		1.36	1.67		0.239	0.037		0.009	0.007		0.117	0.020		
PM-5	02/14	UF	CS				0.03	0.04						0.350	0.055		0.031	0.015		0.218	0.041		
PM-5	06/20	UF	CS											0.261	0.032		0.013	0.009		0.163	0.024		
PM-5	08/14	UF	CS	30	400		0.06	0.22	0.36		0.00	4.03		0.278	0.032		-0.013	0.010		0.141	0.022		
G-1A	08/14	UF	CS	-150	380		0.02	0.22	0.38		-0.93	6.35		0.263	0.032		0.006	0.009		0.149	0.023		
G-2A	06/20	UF	CS											0.245	0.029		0.033	0.013		0.232	0.028		
G-2A	08/14	UF	CS	-60	390		-0.07	0.22	0.38		-1.47	5.14		0.283	0.032		0.006	0.008		0.198	0.026		
G-3A	06/20	UF	CS											0.554	0.044		0.021	0.011		0.244	0.028		
G-3A	08/14	UF	CS	30	400		-0.09	0.22	0.39		0.00	6.97		0.444	0.046		0.013	0.011		0.321	0.038		
G-4A	06/20	UF	CS											0.460	0.042		-0.001	0.013		0.203	0.027		
G-4A	08/14	UF	CS	30	400		0.06	0.22	0.37		-0.74	4.56		0.586	0.049		0.015	0.010		0.249	0.031		
Regional Aquifer Springs																							
White Rock Canyon Group I:																							
Sandia Spring	09/25	F	CS				0.06	0.09	0.32	<	0.67	1.02	3.64	0.202	0.046	0.104	0.024	0.022	0.112	0.174	0.042	0.095	
Sandia Spring	09/25	F	DUP				0.17	0.09	0.29														
Sandia Spring	09/25	UF	CS	-60	56	192																	
Spring 3A	09/25	F	CS				0.07	0.10	0.35	<	0.00	1.72	3.05	0.729	0.098	0.163	0.019	0.024	0.132	0.402	0.066	0.095	
Spring 3A	09/25	F	DUP							<	1.08	0.72	2.62										
Spring 3A	09/25	UF	CS	-30	57	193																	
Spring 4	09/25	F	CS				0.07	0.09	0.31	<	-0.63	0.91	3.12	0.490	0.057	0.029	0.048	0.017	0.043	0.314	0.042	0.029	
Spring 4	09/25	UF	CS	-61	56	195																	
Spring 4A	09/25	F	CS				-0.09	0.08	0.29		9.09	1.59	2.09	0.601	0.068	0.052	0.013	0.013	0.047	0.290	0.042	0.032	
Spring 4A	09/25	F	DUP											0.504	0.077	0.091	0.034	0.017	0.023	0.322	0.058	0.023	
Spring 4A	09/25	UF	CS	-90	55	192																	
Spring 4A	09/25	UF	DUP	-120	54	191																	
Ancho Spring	09/26	F	CS				0.03	0.09	0.33		3.24	1.64	3.08	0.218	0.051	0.134	-0.009	0.017	0.126	0.062	0.026	0.083	
Ancho Spring	09/26	UF	CS	-90	54	191																	

Table 5-27. Radiochemical Analysis of Groundwater for 2000 (pCi/L[a]) (Cont.)

Station Name	Date		Codes[b]	^{3}H			^{90}Sr			^{137}Cs				^{234}U			$^{235,236}U$			^{238}U			U (µg/L, lab)
Regional Aquifer Springs (Cont.)																							
White Rock Canyon Group II:																							
Spring 5A	09/26	F	CS				0.24	0.10	0.34		3.92	1.46	3.38	0.922	0.120	0.106	0.015	0.015	0.073	0.488	0.081	0.106	
Spring 5A	09/26	UF	CS	-148	52	189																	
Spring 5B	07/26	F	CS				0.08	0.11	0.37	<	0.26	1.69	4.18	0.474	0.077	0.099	0.010	0.015	0.086	0.231	0.053	0.130	
Spring 5B	07/26	UF	CS	-90	55	192																	
Spring 6	09/26	F	CS				0.26	0.10	0.32	<	0.35	1.00	3.47	0.267	0.058	0.134	0.010	0.010	0.026	0.100	0.033	0.070	
Spring 6	09/26	UF	CS	-152	54	194																	
Spring 6	09/26	F	CS				0.17	0.10	0.33	<	1.10	1.86	2.99	0.234	0.037	0.041	0.013	0.013	0.048	0.088	0.021	0.012	
Spring 6	09/26	UF	CS	-121	54	194																	
Spring 8A	09/26	F	CS				-0.03	0.11	0.37	<	1.43	1.04	4.06	0.058	0.029	0.117	0.000	0.010	0.077	0.046	0.021	0.061	
Spring 8A	09/26	UF	CS	-30	57	193																	
Spring 9A	09/27	F	CS				4.49	0.31	0.48		-0.20	0.73	2.59	0.229	0.047	0.084	-0.012	0.007	0.084	0.035	0.018	0.057	
Spring 9A	09/27	F	DUP				0.02	0.09	0.30		0.51	0.68	2.45										
Spring 9A	09/27	UF	CS	-120	56	192																	
Doe Spring	09/27	F	CS				0.05	0.09	0.31	<	2.57	1.28	3.04	0.085	0.034	0.135	0.000	1.000	0.022	0.028	0.017	0.060	
Doe Spring	09/27	UF	CS	-30	56	192																	
Spring 10	09/27	F	CS				0.09	0.10	0.35	<	0.59	0.98	3.85	0.427	0.072	0.182	0.030	0.024	0.120	0.257	0.050	0.091	
Spring 10	09/27	UF	CS	-60	55	192																	
White Rock Canyon Group III:																							
Spring 1	09/25	F	CS				0.03	0.12	0.42	<	-1.15	1.43	4.78	1.250	0.144	0.147	0.036	0.021	0.082	0.617	0.089	0.106	
Spring 1	09/25	UF	CS	-69	64	220																	
Spring 2	09/25	F	CS				-0.16	0.13	0.46	<	0.74	0.62	2.33	1.040	0.136	0.144	0.044	0.026	0.102	0.499	0.085	0.118	
Spring 2	09/25	UF	CS	-30	57	193																	
White Rock Canyon Group IV:																							
La Mesita Spring	10/19	F	CS				0.07	0.03	0.11		0.20	0.64	2.31	5.860	0.460	0.090	0.147	0.032	0.044	3.730	0.306	0.056	
La Mesita Spring	10/19	F	DUP								-0.33	0.92	3.19										
La Mesita Spring	10/19	UF	CS	-152	54	194																	
Other Springs:																							
Sacred Spring	10/19	F	CS				0.09	0.04	0.12		-0.55	0.89	3.13	3.400	0.284	0.057	0.096	0.026	0.046	2.140	0.193	0.120	
Sacred Spring	10/19	F	DUP				1.99	0.59	1.88														
Sacred Spring	10/19	UF	CS	-90	55	192																	
Sacred Spring	10/19	UF	DUP	-60	56	193																	
Canyon Alluvial Groundwater Systems																							
Acid/Pueblo Canyons:																							
APCO-1	07/26	UF	CS	690	450		0.40	0.06	0.12		-0.39	3.37		0.454	0.050		0.018	0.014		0.273	0.038		
DP/Los Alamos Canyons:																							
LAO-C	08/01	UF	CS	690	450		0.47	0.06			0.00	9.54		0.229	0.029		0.014	0.012		0.170	0.024		
LAO-0.7	08/01	UF	CS				0.37	0.06	0.13					0.559	0.050	0.093	0.032	0.013	0.024	0.483	0.041	0.017	
LAO-2	06/26	UF	CS	90	450		6.90	0.65	0.14		0.57	1.03		0.099	0.022		-0.008	0.010		0.051	0.015		
LAO-3A	06/26	UF	CS	50	440		24.10	2.20	0.17		1.15	1.01		0.136	0.025		-0.002	0.009		0.076	0.017		
LAO-4	08/01	UF	CS	510	440		5.18	0.47			0.32	1.16		0.123	0.024		0.008	0.009		0.055	0.015		

Table 5-27. Radiochemical Analysis of Groundwater for 2000 (pCi/L[a]) (Cont.)

Station Name	Date		Codes[b]	^{3}H			^{90}Sr				^{137}Cs			^{234}U			^{235,236}U			^{238}U			U (µg/L, lab)	
Canyon Alluvial Groundwater Systems (Cont.)																								
Mortandad Canyon:																								
MCO-2	07/17	UF	CS	130	450		0.67	0.08			0.00	7.02		0.144	0.033		0.008	0.009		0.157	0.023			
MCO-3	07/17	UF	CS	76,300	3,400		24.30	2.20			7.68	1.84		4.277	0.167		0.103	0.023		1.173	0.069			
MCO-5	07/07	UF	CS	6,686	259		55.00	5.00	0.72	<	-0.10	1.45	2.40	1.330	0.110	0.044	0.058	0.015	0.030	0.305	0.038	0.030	1.22	
MCO-5	07/07	F	CS				57.00	5.50	2.20					1.480	0.120	0.046	0.046	0.014	0.034	0.412	0.047	0.029	1.21	
MCO-6	07/10	UF	CS	8,260	313		60.30	7.00	0.87					1.270	0.120	0.021	0.034	0.009	0.015	0.445	0.048	0.010	1.58	
MCO-6	07/10	F	CS				56.80	6.50	0.76					1.250	0.120	0.016	0.027	0.007	0.009	0.451	0.047	0.013	1.56	
MCO-6	07/10	UF	CS	8,184	294						0.69	2.10	7.89											
MCO-6	07/10	F	CS				54.70	13.00	0.81					1.410	0.135	0.024	0.041	0.010	0.016	0.503	0.055	0.012	1.62	
MCO-7	07/10	UF	CS	10,971	383		2.33	0.44	0.95					0.852	0.085	0.021	0.025	0.007	0.014	0.600	0.060	0.010	2.18	
MCO-7	07/10	F	CS				1.93	0.40	0.88					0.775	0.080	0.022	0.026	0.008	0.016	0.657	0.070	0.012	2.18	
MCO-7.5	07/11	UF	CS	16,137	578		0.16	0.19	0.84					0.516	0.060	0.040	0.028	0.105	0.025	0.556	0.065	0.022	1.69	
MCO-7.5	07/11	F	CS				0.10	0.17	0.75					0.503	0.055	0.016	0.028	0.007	0.010	0.454	0.049	0.014	1.60	
Cañada del Buey:																								
CDBO-6	12/12	UF	CS																					
CDBO-6	12/12	UF	DUP																					
Intermediate Perched Groundwater Systems																								
Pueblo/Los Alamos/Sandia Canyon Area Perched System in Conglomerates and Basalt:																								
POI-4	07/19	UF	CS	140	450		-0.01	0.04	0.12		-0.90	2.48		1.215	0.069		0.039	0.013		0.769	0.052			
Basalt Spring	07/25	F	CS				0.88	0.09	0.13		-3.50	31.14		0.382	0.042		0.003	0.016		0.274	0.034			
Basalt Spring	07/25	UF	CS	420	430																			
Water Canyon Gallery	08/15	UF	CS	30	400		0.03	0.22	0.38		0.00	6.22		0.140	0.023		0.018	0.011		0.105	0.018			
San Ildefonso Pueblo:																								
LA-5	12/06	UF	CS	-145	55	196	-0.05	0.11	0.40	<	-0.78	0.59	2.00	0.617	0.086	0.096	0.033	0.019	0.075	0.329	0.058	0.074		
Eastside Artesian Well	04/05	UF	CS	-110	450						0.46	0.91											0.05	0.09
Eastside Artesian Well	04/05	UF	CS				0.03	0.03																
Pajarito Well (Pump 1)	11/29	UF	CS	-204	55	203	0.11	0.12	0.39	<	-0.05	0.67	2.37	11.100	1.070	0.213	0.161	0.059	0.165	3.120	0.360	0.165		
Pajarito Well (Pump 1)	11/29	UF	DUP				0.08	0.06	0.20	<	-0.13	0.67	2.37	9.210	0.856	0.108	0.191	0.058	0.137	2.890	0.319	0.158		
Don Juan Playhouse Well	04/05	UF	CS	30	460						0.48	0.91											5.90	0.30
Don Juan Playhouse Well	04/05	UF	CS				0.01	0.04																
Otowi House Well	12/06	UF	CS	-116	55	196	0.13	0.10	0.35	<	-0.05	0.68	2.39	2.240	0.240	0.105	0.057	0.029	0.106	1.250	0.157	0.136		
New Community Well	11/29	UF	CS	-171	54	198	0.04	0.12	0.42	<	1.09	0.95	3.32	13.400	1.150	0.033	0.323	0.069	0.090	9.670	0.854	0.089		
New Community Well	11/29	UF	CS	-147	57	204	0.00	0.12	0.41	<	-0.25	0.64	2.22	13.300	1.120	0.100	0.390	0.073	0.101	8.490	0.738	0.029		
New Community Well	11/29	UF	DUP	-147	57	204																		
Sanchez House Well	04/05	UF	CS	10	460						-0.47	7.24											7.30	0.30
Sanchez House Well	04/05	UF	CS	10	460						0.13	0.83											6.60	0.30
Sanchez House Well	04/05	UF	CS				-0.02	0.03																
Sanchez House Well	04/05	UF	CS				0.00	0.03																
Sanchez House Well	04/05	UF	DUP				0.06	0.03																
Water Quality Standards[c]																								
DOE DCG for Public Dose				2,000,000			1,000				3,000			500			600			600			800	
DOE Drinking Water System DCG				80,000			40				120			20			24			24			30	
EPA Primary Drinking Water Standard				20,000			8																30	
EPA Screening Level																								
NMWQCC Groundwater Limit																							5,000	

Table 5-27. Radiochemical Analysis of Groundwater for 2000 (pCi/L[a]) (Cont.)

Station Name	Date	Codes[b]		U (µg/L, calc)		^{238}Pu			^{239,240}Pu			^{241}Am			Gross Alpha			Gross Beta			Gross Gamma	
Regional Aquifer Wells																						
Test Wells:																						
Test Well 1	05/02	UF	CS	3.29	0.20	0.025	0.009		0.021	0.009		0.052	0.013		5.2	2.4		3.3	1.7		82.7	49.2
Test Well 2	05/03	UF	CS	0.07	0.04	0.035	0.012		0.015	0.008		0.018	0.007		0.2	0.4		1.4	0.9		108.0	49.3
Test Well 3	05/03	UF	CS	0.54	0.08	0.005	0.007		0.001	0.008		-0.008	0.008		0.2	0.4		1.4	0.9		50.6	48.9
Test Well 3	05/03	UF	CS	0.63	0.08	0.063	0.012		0.056	0.012		0.006	0.003		0.7	0.8		1.0	0.7		80.7	49.1
Test Well 4	05/02	UF	CS	0.07	0.04	0.006	0.004		0.007	0.006		0.005	0.003		0.1	0.2		1.0	0.7		45.1	48.9
Test Well 8	05/02	UF	CS	0.68	0.10	0.020	0.012		0.010	0.008		0.002	0.002		0.4	0.6		2.6	1.4		138.8	49.5
Test Well DT-5A	10/26	UF	CS	0.35	0.09	0.045	0.019	0.047	0.025	0.014	0.037	0.000	1.000	0.028	0.2	0.2	0.6	0.7	0.4	1.3		
Test Well DT-5A	10/26	UF	DUP									0.022	0.012	0.035								
Test Well DT-5A	10/26	UF	CS	0.28	0.47	0.051	0.018	0.037	0.020	0.011	0.029	0.017	0.009	0.025	0.4	0.3	0.7	0.9	0.4	1.4		
Test Well DT-10	10/27	UF	CS	0.50	0.11	0.042	0.016	0.031	-0.004	0.004	0.031	0.023	0.011	0.028	0.4	0.2	0.5	1.0	0.4	1.3		
Test Well DT-10	10/27	UF	DUP																			
Water Supply Wells:																						
O-1	06/21	UF	CS	1.67	0.13																	
O-1	08/14	UF	CS	1.26	0.11							0.046	0.010		1.9	2.2		2.7	2.0		47.0	48.8
O-1	08/14	UF	CS	1.44	0.12	0.001	0.006	0.029	-0.001	0.005	0.026	0.011	0.006		1.4	1.3		3.2	1.7		97.5	49.2
O-4	06/21	UF	CS	0.75	0.09																	
O-4	08/14	UF	CS	0.80	0.09	0.002	0.005	0.023	0.003	0.007	0.032	0.000	0.001		0.9	1.9		0.8	0.8		70.9	49.0
PM-1	02/14	UF	CS	1.79	0.21																	
PM-1	06/20	UF	CS	1.74	0.14																	
PM-1	08/14	UF	CS	1.75	0.13	0.000		0.010	0.001	0.004	0.023	0.026	0.009		2.6	2.5		2.2	1.7		97.5	49.2
PM-1	08/14	UF	CS	0.33	0.06	0.008	0.010	0.041	0.007	0.007	0.028	-0.008	0.010		3.6	1.0		3.7	1.9		46.3	48.8
PM-2	02/14	UF	CS	0.28	0.07																	
PM-2	06/20	UF	CS	0.32	0.06																	
PM-2	08/14	UF	CS	0.32	0.06	0.024	0.009	0.017	0.001	0.005	0.029	0.003	0.002		0.3	1.0		1.8	1.2		66.8	49.0
PM-3	06/21	UF	CS	0.88	0.09																	
PM-3	08/14	UF	CS	0.95	0.10	0.003	0.009	0.042	0.023	0.012	0.034	0.016	0.009		-0.2	0.2		3.3	2.3		113.8	49.3
PM-4	06/21	UF	CS	0.35	0.06																	
PM-4	08/14	UF	CS	0.35	0.06	0.002	0.004	0.022	0.013	0.008	0.022	0.024	0.009		0.5	0.9		1.4	1.0		141.8	49.5
PM-5	02/14	UF	CS	0.66	0.12																	
PM-5	06/20	UF	CS	0.49	0.07																	
PM-5	08/14	UF	CS	0.41	0.07	0.005	0.006	0.026	0.014	0.008	0.019	-0.004	0.005		0.4	0.9		1.5	1.1		83.8	49.1
G-1A	08/14	UF	CS	0.45	0.07	0.005	0.007	0.027	0.006	0.010	0.045	-0.003	0.002		0.6	1.0		1.9	1.2		113.1	49.3
G-2A	06/20	UF	CS	0.71	0.08																	
G-2A	08/14	UF	CS	0.59	0.08	-0.005	0.008	0.046	0.014	0.013	0.049	-0.023	0.043		0.2	1.3		1.9	1.2		110.4	49.3
G-3A	06/20	UF	CS	0.74	0.08																	
G-3A	08/14	UF	CS	0.96	0.11	0.003	0.007	0.032	0.005	0.005	0.020	0.003	0.002		0.3	1.0		1.2	0.9		176.5	49.7
G-4A	06/20	UF	CS	0.60	0.08																	
G-4A	08/14	UF	CS	0.75	0.09	0.021	0.010		-0.002	0.002		0.004	0.003		0.8	1.0		1.8	1.2		127.5	49.4
Regional Aquifer Springs																						
White Rock Canyon Group I:																						
Sandia Spring	09/25	F	CS	0.53	0.12	0.081	0.022	0.012	0.017	0.009	0.012	0.028	0.010	0.023	-0.3	0.4	1.9	4.2	0.9	2.6		
Sandia Spring	09/25	F	DUP												-0.4	0.6	2.4	3.8	1.1	3.3		
Sandia Spring	09/25	UF	CS																			
Spring 3A	09/25	F	CS	1.21	0.20	0.041	0.016	0.034	0.015	0.008	0.010	0.051	0.013	0.008	1.0	0.5	1.4	1.8	0.8	2.5		
Spring 3A	09/25	F	DUP																			
Spring 3A	09/25	UF	CS																			
Spring 4	09/25	F	CS	0.96	0.13	0.026	0.014	0.040	0.011	0.007	0.010	0.030	0.010	0.009	0.6	0.4	1.4	2.8	0.8	2.3		
Spring 4	09/25	UF	CS																			
Spring 4A	09/25	F	CS	0.87	0.12	0.003	0.006	0.024	0.003	0.003	0.009	0.012	0.008	0.027	1.0	0.5	1.5	2.6	0.8	2.6		
Spring 4A	09/25	F	DUP	0.97	0.17	0.003	0.003	0.009	0.009	0.007	0.023	0.051	0.014	0.009								
Spring 4A	09/25	UF	CS																			
Spring 4A	09/25	UF	DUP																			
Ancho Spring	09/26	F	CS	0.18	0.08	0.008	0.008	0.030	-0.004	0.007	0.038	0.030	0.013	0.031	-0.1	0.3	1.4	4.0	0.8	2.2		
Ancho Spring	09/26	UF	CS																			

Table 5-27. Radiochemical Analysis of Groundwater for 2000 (pCi/L[a]) (Cont.)

Station Name	Date		Codes[b]	U (µg/L, calc)		^{238}Pu			^{239,240}Pu			^{241}Am			Gross Alpha			Gross Beta			Gross Gamma	
Regional Aquifer Springs (Cont.)																						
White Rock Canyon Group II:																						
Spring 5A	09/26	F	CS	1.46	0.24	-0.003	0.006	0.032	0.010	0.009	0.032	0.013	0.009	0.030	1.4	0.7	1.9	3.9	0.9	2.8		
Spring 5A	09/26	UF	CS																			
Spring 5B	07/26	F	CS	0.69	0.16	0.000	0.007	0.034	0.007	0.005	0.010	0.024	0.010	0.025	0.1	0.4	1.6	1.2	0.8	2.8		
Spring 5B	07/26	UF	CS																			
Spring 6	09/26	F	CS	0.30	0.10	0.004	0.004	0.010	-0.004	0.007	0.035	0.020	0.008	0.009	0.3	0.3	1.1	1.5	0.8	2.5		
Spring 6	09/26	UF	CS																			
Spring 6	09/26	F	CS	0.27	0.06	0.025	0.010	0.010	-0.004	0.006	0.033	0.027	0.009	0.008	0.1	0.6	2.1	1.6	0.9	3.0		
Spring 6	09/26	UF	CS																			
Spring 8A	09/26	F	CS	0.14	0.06	0.025	0.010	0.010	0.014	0.007	0.010	0.013	0.007	0.012	-0.3	0.4	1.9	1.4	1.0	3.3		
Spring 8A	09/26	UF	CS																			
Spring 9A	09/27	F	CS	0.10	0.05	0.006	0.011	0.045	0.006	0.006	0.017	0.025	0.012	0.031	0.4	0.4	1.3	2.0	0.8	2.5		
Spring 9A	09/27	F	DUP												-0.3	0.4	1.7	1.7	0.8	2.5		
Spring 9A	09/27	UF	CS																			
Doe Spring	09/27	F	CS	0.08	0.47	0.012	0.012	0.043	0.028	0.014	0.037	0.034	0.013	0.031	-0.1	0.3	1.5	0.9	0.8	2.7		
Doe Spring	09/27	UF	CS																			
Spring 10	09/27	F	CS	0.78	0.15	0.032	0.012	0.010	0.014	0.007	0.010	0.028	0.011	0.011	0.5	0.5	1.8	2.4	0.9	2.9		
Spring 10	09/27	UF	CS																			
White Rock Canyon Group III:																						
Spring 1	09/25	F	CS	1.85	0.26	0.012	0.007	0.011	0.004	0.007	0.029	0.017	0.008	0.009	2.1	0.7	1.9	3.1	1.0	3.1		
Spring 1	09/25	UF	CS																			
Spring 2	09/25	F	CS	1.51	0.25	0.042	0.014	0.010	0.008	0.008	0.028	0.027	0.011	0.025	1.3	0.8	2.3	1.8	0.9	2.8		
Spring 2	09/25	UF	CS																			
White Rock Canyon Group IV:																						
La Mesita Spring	10/19	F	CS	11.17	0.91	0.014	0.007	0.010	0.004	0.008	0.033	0.008	0.006	0.011	8.1	1.6	0.7	4.7	0.5	1.4		
La Mesita Spring	10/19	F	DUP																			
La Mesita Spring	10/19	UF	CS																			
Other Springs:																						
Sacred Spring	10/19	F	CS	6.41	0.57	0.007	0.005	0.009	0.007	0.005	0.009	0.005	0.005	0.013	0.9	0.4	0.9	2.6	0.5	1.5		
Sacred Spring	10/19	F	DUP			0.006	0.005	0.009	0.006	0.005	0.009	0.005	0.009	0.039	0.8	0.3	1.0	2.5	0.5	1.4		
Sacred Spring	10/19	UF	CS																			
Sacred Spring	10/19	UF	DUP																			
Canyon Alluvial Groundwater Systems																						
Acid/Pueblo Canyons:																						
APCO-1	07/26	UF	CS	0.82	0.11	0.004	0.006		0.148	0.024		0.021	0.009		2.0	2.5		16.7	8.5		29.3	51.1
DP/Los Alamos Canyons:																						
LAO-C	08/01	UF	CS	0.51	0.07	0.076	0.014		0.007	0.007		0.051	0.012		0.5	1.3		2.6	1.6		129.4	51.7
LAO-0.7	08/01	UF	CS	1.45	0.12	0.012	0.008	0.025	0.021	0.009	0.022	0.024	0.009	0.026								
LAO-2	06/26	UF	CS	0.15	0.05	0.012	0.008		0.035	0.014		0.011	0.011		3.4	2.5		20.7	6.6		34.9	48.8
LAO-3A	06/26	UF	CS	0.23	0.05	0.006	0.010		0.026	0.014		0.007	0.006		1.8	2.0		55.5	13.5		42.4	48.9
LAO-4	08/01	UF	CS	0.17	0.05	0.014	0.008		0.015	0.009		-0.607	0.536		1.2	1.3		15.2	4.7		118.7	51.7

Table 5-27. Radiochemical Analysis of Groundwater for 2000 (pCi/L[a]) (Cont.)

Station Name	Date	Codes[b]		U (µg/L, calc)		^{238}Pu			^{239,240}Pu			^{241}Am			Gross Alpha			Gross Beta			Gross Gamma	
Canyon Alluvial Groundwater Systems (Cont.)																						
Mortandad Canyon:																						
MCO-2	07/17	UF	CS	0.47	0.07	0.017	0.009		0.012	0.008		0.007	0.005		2.2	2.1		7.2	4.9		106.6	51.6
MCO-3	07/17	UF	CS	3.54	0.20	1.182	0.106		0.607	0.071		1.534	0.068		21.2	8.6		102.0	25.7		57.9	51.3
MCO-5	07/07	UF	CS	0.93	0.11	0.033	0.012	0.027	0.050	0.014	0.022	0.106	0.026	0.044								
MCO-5	07/07	F	CS	1.25	0.14	0.059	0.016	0.024	0.020	0.009	0.024	0.107	0.025	0.038								
MCO-6	07/10	UF	CS	1.34	0.14	0.020	0.006	0.011	0.014	0.005	0.013	0.077	0.014	0.013								
MCO-6	07/10	F	CS	1.35	0.14	0.014	0.005	0.006	0.004	0.003	0.013	0.080	0.014	0.005								
MCO-6	07/10	UF	CS									-1.150	4.700	16.800								
MCO-6	07/10	F	CS	1.52	0.16	0.029	0.007	0.005	0.017	0.006	0.010	0.083	0.013	0.010								
MCO-7	07/10	UF	CS	1.80	0.18	0.012	0.005	0.012	0.020	0.007	0.013	0.106	0.016	0.004								
MCO-7	07/10	F	CS	1.97	0.21	0.033	0.008	0.004	0.007	0.004	0.011	0.121	0.018	0.012								
MCO-7.5	07/11	UF	CS	1.67	0.20	0.010	0.004	0.005	0.004	0.003	0.010	0.249	0.030	0.013								
MCO-7.5	07/11	F	CS	1.36	0.15	0.010	0.004	0.005	0.004	0.003	0.012	0.218	0.026	0.005								
Cañada del Buey:																						
CDBO-6	12/12	UF	CS												0.6	0.3	1.1					
CDBO-6	12/12	UF	DUP												0.8	0.2	0.6					
Intermediate Perched Groundwater Systems																						
Pueblo/Los Alamos/Sandia Canyon Area Perched System in Conglomerates and Basalt:																						
POI-4	07/19	UF	CS	2.31	0.16	0.010	0.007		0.020	0.009		0.010	0.007		4.4	3.6		10.0	7.2		44.3	51.2
Basalt Spring	07/25	F	CS	0.82	0.10	0.018	0.009		0.008	0.009		0.032	0.013		1.0	1.9		12.3	7.6		37.2	51.1
Basalt Spring	07/25	UF	CS																			
Water Canyon Gallery	08/15	UF	CS	0.32	0.05	0.018	0.008	0.015	0.007	0.006	0.015	0.017	0.006		0.6	1.0		1.1	0.9		190.8	49.8
San Ildefonso Pueblo:																						
LA-5	12/06	UF	CS	0.99	0.17	0.094	0.022	0.013	0.010	0.007	0.013	0.021	0.013	0.043	0.5	0.4	1.0	1.3	0.5	1.8		
Eastside Artesian Well	04/05	UF	CS			0.013	0.010		0.006	0.006		-0.016	0.189		187.0	39.6		2.1	1.9		84.9	50.5
Eastside Artesian Well	04/05	UF	CS																			
Pajarito Well (Pump 1)	11/29	UF	CS	9.36	1.07	0.049	0.016	0.032	0.002	0.008	0.041	0.031	0.011	0.011	5.0	3.2	1.2	1.9	0.6	1.8		
Pajarito Well (Pump 1)	11/29	UF	DUP	8.69	0.95	0.027	0.010	0.022	-0.003	0.005	0.028	0.029	0.015	0.020								
Don Juan Playhouse Well	04/05	UF	CS			0.036	0.011		0.004	0.007		0.011	0.005		6.1	3.8		6.1	3.5		77.3	50.5
Don Juan Playhouse Well	04/05	UF	CS																			
Otowi House Well	12/06	UF	CS	3.75	0.47	0.305	0.043	0.045	0.016	0.010	0.035	0.010	0.012	0.045	2.0	1.2	1.3	3.2	0.6	1.8		
New Community Well	11/29	UF	CS	28.93	2.54	0.030	0.012	0.014	0.025	0.011	0.014	0.034	0.013	0.013	16.0	6.9	1.8	6.9	0.7	1.8		
New Community Well	11/29	UF	CS	25.45	2.20	0.069	0.020	0.044	0.215	0.034	0.035	0.030	0.013	0.032	4.2	0.9	1.0	2.2	0.6	1.7		
New Community Well	11/29	UF	DUP																			
Sanchez House Well	04/05	UF	CS			0.015	0.008		-0.001	0.006		-0.009	0.014		12.4	6.5		4.5	3.5		133.6	50.9
Sanchez House Well	04/05	UF	CS			0.012	0.007		0.014	0.008		0.007	0.005		5.4	4.4		7.4	4.6		58.5	50.4
Sanchez House Well	04/05	UF	CS																			
Sanchez House Well	04/05	UF	CS																			
Sanchez House Well	04/05	UF	DUP																			
Water Quality Standards[c]																						
DOE DCG for Public Dose				800		40			30			30			30			1,000				
DOE Drinking Water System DCG				30		1.6			1.2			1.2			1.2			40				
EPA Primary Drinking Water Standard				30											15							
EPA Screening Level																		50				
NMWQCC Groundwater Limit				5,000																		

[a] Except where noted. Three columns are listed: the first is the analytical result, the second is the radioactive counting uncertainty (1 standard deviation), and the third is the analytical laboratory measurement-specific minimum detectable activity.

[b] Codes: UF–unfiltered; F–filtered; CS–customer sample; DUP–laboratory duplicate.

[c] Standards given here for comparison only; see Appendix A.

Table 5-28. Detections of Radionuclides[a] and Comparison to Standards[b] in Groundwater for 2000

Station Name	Date		Code[c]	Analyte	Result	Uncertainty[d]	MDA[e]	Units	Lab Qual Code[f]	Result/ Minimum Standard	Minimum Standard	Minimum Standard Type	DOE DCG	Result/ DOE DCG
Regional Aquifer Wells														
Test Wells:														
Test Well 1	05/02	UF	CS	^{241}Am	0.052	0.013		pCi/L						
Test Well 3	05/03	UF	CS	^{238}Pu	0.063	0.012		pCi/L						
Test Well 3	05/03	UF	CS	^{239,240}Pu	0.056	0.012		pCi/L						
Water Supply Wells:														
O-1	06/21	UF	DUP	^{90}Sr	0.19	0.05	0.15	pCi/L						
O-1	07/07	UF	CS	^{3}H	38.0	1.3		pCi/L						
O-1	08/14	UF	CS	^{241}Am	0.046	0.010		pCi/L						
O-1	10/16	UF	CS	^{3}H	31.9	1.0		pCi/L						
O-1	10/16	UF	CS	^{3}H	35.4	1.3		pCi/L						
O-1	11/15	UF	CS	^{3}H	23.8	0.8		pCi/L						
O-1	12/12	UF	CS	^{3}H	22.0	0.8		pCi/L						
O-1	12/12	UF	CS	^{3}H	23.9	0.8		pCi/L						
G-3A	06/20	UF	CS	^{90}Sr	0.17	0.04	0.13	pCi/L						
Regional Aquifer Springs														
White Rock Canyon Group I:														
Sandia Spring	09/25	F	CS	^{238}Pu	0.081	0.022	0.012	pCi/L						
Spring 3A	09/25	F	CS	^{241}Am	0.051	0.013	0.008	pCi/L						
Spring 4A	09/25	F	DUP	^{241}Am	0.051	0.014	0.009	pCi/L						
Spring 4A	09/25	F	CS	^{241}Am	0.027	0.008	0.027	pCi/L	U					
Spring 4A	09/25	F	CS	^{137}Cs	9.090	1.590	2.090	pCi/L						
Spring 4A	09/25	F	CS	^{238}Pu	0.024	0.006	0.024	pCi/L	U					
Ancho Spring	09/26	F	CS	^{238}Pu	0.030	0.008	0.030	pCi/L	U					
Ancho Spring	09/26	F	CS	^{239,240}Pu	0.038	0.007	0.038	pCi/L	U					
White Rock Canyon Group II:														
Spring 5A	09/26	F	CS	^{241}Am	0.030	0.009	0.030	pCi/L	U					
Spring 5A	09/26	F	CS	^{238}Pu	0.032	0.006	0.032	pCi/L	U					
Spring 5A	09/26	F	CS	^{239,240}Pu	0.032	0.009	0.032	pCi/L	U					
Spring 5B	07/26	F	CS	^{238}Pu	0.034	0.007	0.034	pCi/L	U					
Spring 6	09/26	F	CS	^{239,240}Pu	0.035	0.007	0.035	pCi/L	U					
Spring 6	09/26	F	CS	^{239,240}Pu	0.033	0.006	0.033	pCi/L	U					
Spring 9A	09/27	F	CS	^{90}Sr	4.49	0.31	0.48	pCi/L		0.56	8	EPA PRIM DW STD		
Doe Spring	09/27	F	CS	^{238}Pu	0.043	0.012	0.043	pCi/L	U					

Table 5-28. Detections of Radionuclides[a] and Comparison to Standards[b] in Groundwater for 2000 (Cont.)

Station Name	Date		Code[c]	Analyte	Result	Uncertainty[d]	MDA[e]	Units	Lab Qual Code[f]	Result/ Minimum Standard	Minimum Standard	Minimum Standard Type	DOE DCG	Result/ DOE DCG
Regional Aquifer Springs (Cont.)														
White Rock Canyon Group III:														
Spring 1	09/25	F	CS	$^{239,240}Pu$	0.029	0.007	0.029	pCi/L	U					
Spring 2	09/25	F	CS	^{238}Pu	0.042	0.014	0.010	pCi/L						
Spring 2	09/25	F	CS	$^{239,240}Pu$	0.028	0.008	0.028	pCi/L	U					
White Rock Canyon Group IV:														
La Mesita Spring	10/19	F	CS	Gross Alpha	8.1	1.6	0.7	pCi/L		0.54	15	EPA PRIM DW STD		
La Mesita Spring	10/19	F	TOTC	U	11.2	0.9		µg/L						
Other Springs:														
Sacred Spring	10/19	F	DUP	^{90}Sr	1.99	0.59	1.88	pCi/L						
Sacred Spring	10/19	F	TOTC	U	6.4	0.6		µg/L						
Canyon Alluvial Groundwater Systems														
Acid/Pueblo Canyons:														
APCO-1	07/26	UF	CS	$^{239,240}Pu$	0.148	0.024		pCi/L						
APCO-1	07/26	UF	CS	^{90}Sr	0.40	0.06	0.12	pCi/L						
DP/Los Alamos Canyons:														
LAO-C	08/01	UF	CS	^{241}Am	0.051	0.012		pCi/L						
LAO-C	08/01	UF	CS	^{238}Pu	0.076	0.014		pCi/L						
LAO-C	08/01	UF	CS	^{90}Sr	0.47	0.06		pCi/L						
LAO-0.7	08/01	UF	CS	^{90}Sr	0.37	0.06	0.13	pCi/L						
LAO-2	06/26	UF	CS	Gross Beta	20.7	6.6		pCi/L						
LAO-2	06/26	UF	CS	^{90}Sr	6.90	0.65	0.14	pCi/L		0.86	8	EPA PRIM DW STD		
LAO-3A	06/26	UF	CS	Gross Beta	55.5	13.5		pCi/L		1.11	50	EPA SEC DW LVL		
LAO-3A	06/26	UF	CS	^{90}Sr	24.10	2.20	0.17	pCi/L		3.01	8	EPA SEC DW LVL		
LAO-4	08/01	UF	CS	^{90}Sr	5.18	0.47		pCi/L		0.65	8	EPA PRIM DW STD		
Mortandad Canyon:														
MCO-2	07/17	UF	CS	^{90}Sr	0.67	0.08		pCi/L						
MCO-3	07/17	UF	CS	^{241}Am	1.534	0.068		pCi/L		1.28	1.2	DOE DW DCG		
MCO-3	07/17	UF	CS	^{137}Cs	7.680	1.840		pCi/L						
MCO-3	07/17	UF	CS	Gross Beta	102.0	25.7		pCi/L		2.04	50	EPA SEC DW LVL		
MCO-3	07/17	UF	CS	^{3}H	76,300	3,400		pCi/L		3.82	20,000	EPA SEC DW LVL		

Table 5-28. Detections of Radionuclides[a] and Comparison to Standards[b] in Groundwater for 2000 (Cont.)

Station Name	Date	Code[c]	Analyte	Result	Uncertainty[d]	MDA[e]	Units	Lab Qual Code[f]	Result/ Minimum Standard	Minimum Standard	Minimum Standard Type	DOE DCG	Result/ DOE DCG
Canyon Alluvial Groundwater Systems (Cont.)													
Mortandad Canyon (Cont):													
MCO-3	07/17	UF CS	^{238}Pu	1.182	0.106		pCi/L		0.74	1.6	EPA PRIM DW STD		
MCO-3	07/17	UF CS	^{239,240}Pu	0.607	0.071		pCi/L		0.51	1.2	EPA PRIM DW STD		
MCO-3	07/17	UF CS	^{90}Sr	24.30	2.20		pCi/L		3.04	8	EPA SEC DW LVL		
MCO-5	07/07	F CS	^{241}Am	0.107	0.025	0.038	pCi/L						
MCO-5	07/07	F CS	^{238}Pu	0.059	0.016	0.024	pCi/L						
MCO-5	07/07	F CS	^{90}Sr	57.00	5.50	2.20	pCi/L		7.13	8	EPA SEC DW LVL		
MCO-5	07/07	UF CS	^{241}Am	0.106	0.026	0.044	pCi/L						
MCO-5	07/07	UF CS	^{3}H	6,686	259		pCi/L						
MCO-5	07/07	UF CS	^{239,240}Pu	0.050	0.014	0.022	pCi/L						
MCO-5	07/07	UF CS	^{90}Sr	55.00	5.00	0.72	pCi/L		6.88	8	EPA SEC DW LVL		
MCO-6	07/10	F CS	^{241}Am	0.080	0.014	0.005	pCi/L						
MCO-6	07/10	F CS	^{241}Am	0.083	0.013	0.010	pCi/L						
MCO-6	07/10	F CS	^{238}Pu	0.029	0.007	0.005	pCi/L						
MCO-6	07/10	F CS	^{90}Sr	56.80	6.50	0.76	pCi/L		7.10	8	EPA SEC DW LVL		
MCO-6	07/10	F CS	^{90}Sr	54.70	13.00	0.81	pCi/L		6.84	8	EPA SEC DW LVL		
MCO-6	07/10	UF CS	^{241}Am	0.077	0.014	0.013	pCi/L						
MCO-6	07/10	UF CS	^{3}H	8,260	313		pCi/L						
MCO-6	07/10	UF CS	^{3}H	8,184	294		pCi/L						
MCO-6	07/10	UF CS	^{238}Pu	0.020	0.006	0.011	pCi/L						
MCO-6	07/10	UF CS	^{90}Sr	60.30	7.00	0.87	pCi/L		7.54	8	EPA SEC DW LVL		
MCO-7	07/10	F CS	^{241}Am	0.121	0.018	0.012	pCi/L						
MCO-7	07/10	F CS	^{238}Pu	0.033	0.008	0.004	pCi/L						
MCO-7	07/10	F CS	^{90}Sr	1.93	0.40	0.88	pCi/L						
MCO-7	07/10	UF CS	^{241}Am	0.106	0.016	0.004	pCi/L						
MCO-7	07/10	UF CS	^{3}H	10,971	383		pCi/L		0.55	20,000	EPA PRIM DW STD		
MCO-7	07/10	UF CS	^{239,240}Pu	0.020	0.007	0.013	pCi/L						
MCO-7	07/10	UF CS	^{90}Sr	2.33	0.44	0.95	pCi/L						
MCO-7.5	07/11	F CS	^{241}Am	0.218	0.026	0.005	pCi/L						
MCO-7.5	07/11	UF CS	^{241}Am	0.249	0.030	0.013	pCi/L						
MCO-7.5	07/11	UF CS	^{3}H	16,137	578		pCi/L		0.81	20,000	EPA PRIM DW STD		

Table 5-28. Detections of Radionuclides[a] and Comparison to Standards[b] in Groundwater for 2000 (Cont.)

Station Name	Date	Code[c]	Analyte	Result	Uncertainty[d]	MDA[e]	Units	Lab Qual Code[f]	Result/ Minimum Standard	Minimum Standard	Minimum Standard Type	DOE DCG	Result/ DOE DCG
Intermediate Perched Groundwater Systems													
Pueblo/Los Alamos/Sandia Canyon Area Perched System in Conglomerates and Basalt:													
Basalt Spring	07/25	F CS	^{90}Sr	0.88	0.09	0.13	pCi/L						
San Ildefonso Pueblo:													
LA-5	12/06	UF CS	^{238}Pu	0.094	0.022	0.013	pCi/L						
Eastside Artesian Well	04/05	UF CS	Gross Alpha	187.0	39.6		pCi/L		12.47	15	EPA PRIM DW STD	30	6.23
Pajarito Well (Pump 1)	11/29	UF CS	^{238}Pu	0.049	0.016	0.032	pCi/L						
Pajarito Well (Pump 1)	11/29	UF TOTC	U	9.4	1.1		µg/L						
Pajarito Well (Pump 1)	11/29	UF TOTCD	U	8.7	0.9		µg/L						
Don Juan Playhouse Well	04/05	UF CS	^{238}Pu	0.036	0.011		pCi/L						
Don Juan Playhouse Well	04/05	UF CS	U	5.9	0.3		µg/L						
Otowi House Well	12/06	UF CS	^{238}Pu	0.305	0.043	0.045	pCi/L						
New Community Well	11/29	UF CS	^{238}Pu	0.069	0.020	0.044	pCi/L						
New Community Well	11/29	UF CS	$^{239,240}Pu$	0.215	0.034	0.035	pCi/L						
New Community Well	11/29	UF TOTC	U	28.9	2.5		µg/L		0.96	30	EPA SEC DW LVL		
New Community Well	11/29	UF TOTC	U	25.5	2.2		µg/L		0.85	30	EPA SEC DW LVL		
Sanchez House Well	04/05	UF CS	U	7.3	0.3		µg/L						
Sanchez House Well	04/05	UF CS	U	6.6	0.3		µg/L						

[a] Detection defined as value ≥ 3× uncertainty and ≥ detection limit, except values shown for uranium ≥5 µg/L, for gross alpha ≥5 pCi/L, and for gross beta ≥20 pCi/L. Note that some results in this table were qualified as nondetections by the analytical laboratory.

[b] Values indicated by entries in right-hand columns are greater than half the minimum standard shown. The minimum standard is either a DOE DCG for DOE-administered drinking water systems or an EPA drinking water standard.

[c] Codes: UF–unfiltered, F–filtered, CS–customer sample; DUP–duplicate; TRP–triplicate; RE–reanalysis; TOTC–value calculated from other results; TOTCD–duplicate calculated value.

[d] One standard deviation radioactivity counting uncertainty.

[e] MDA = minimum detectable activity.

[f] Codes: B–analyte found in lab blank; U–analyte not detected.

Table 5-29. Special Regional Aquifer Sampling for Strontium-90 During 2000[a]

Station Name	Date	Codes[b]		Result	Uncertainty	MDA	Detect?[c]
Test Well 1	05/02	UF	CS	0.04	0.03	0.10	
Test Well 1	05/02	UF	DUP	0.04	0.03	0.09	
Test Well 1	09/12	UF	CS	0.01	0.13	0.46	
Test Well 1	09/12	UF	DUP	–0.06	0.09	0.32	
Test Well 1	12/13	UF	CS	–0.03	0.07	0.24	
Test Well 2	05/03	UF	CS	0.03	0.03	0.10	
Test Well 2	09/12	UF	CS	–0.22	0.14	0.50	
Test Well 2	12/13	UF	CS	0.01	0.07	0.24	
Test Well 3	05/03	UF	CS	0.03	0.03	0.10	
Test Well 3	05/03	UF	CS	0.04	0.03	0.10	
Test Well 3	09/27	UF	CS	0.10	0.12	0.42	
Test Well 3	12/18	UF	CS	0.07	0.08	0.26	
Test Well 3	12/18	UF	DUP	–0.04	0.05	0.20	
Test Well 4	05/02	UF	CS	0.01	0.03	0.10	
Test Well 4	09/12	UF	CS	0.06	0.14	0.48	
Test Well 4	12/18	UF	CS	–0.10	0.08	0.30	
Test Well 8	05/02	UF	CS	0.04	0.03	0.10	
Test Well 8	09/13	UF	CS	0.00	0.11	0.38	
Test Well 8	12/11	UF	CS	0.06	0.07	0.24	
Test Well DT-5A	10/26	UF	CS	–0.03	0.12	0.44	
Test Well DT-5A	10/26	UF	CS	–0.01	0.12	0.43	
Test Well DT-5A	12/19	UF	CS	–0.08	0.10	0.36	
Test Well DT-10	10/27	UF	CS	–0.02	0.10	0.37	
Test Well DT-10	12/19	UF	CS	0.09	0.08	0.27	
O-1	06/21	UF	CS	0.07	0.05	0.16	
O-1	06/21	UF	DUP	0.19	0.05	0.15	Detect
O-1	06/21	UF	RE	0.02	0.03	0.11	
O-1	08/03	UF	CS	0.03	0.43	0.74	
O-1	08/03	UF	DUP	–0.04	0.32	0.57	
O-1	08/03	UF	CS	0.07	0.04	0.13	
O-1	08/03	UF	CS	0.23	0.14	0.23	
O-1	08/03	UF	CS	–0.10	0.39	0.68	
O-1	08/03	UF	CS	–0.09	0.05	0.17	
O-1	08/14	UF	CS	–0.03	0.15	0.25	
O-1	08/14	UF	CS	–0.01	0.05		
O-1	08/14	UF	CS	0.01	0.05		
O-1	08/14	UF	DUP	0.00	0.05		
O-1	11/15	UF	CS	–0.09	0.07	0.24	
O-4	06/21	UF	CS	0.07	0.05	0.16	
O-4	06/21	UF	DUP	0.14	0.05	0.15	
O-4	08/14	UF	CS	0.05	0.11	0.19	
O-4	08/14	UF	CS	0.05	0.04		
O-4	11/15	UF	CS	–0.09	0.08	0.29	
PM-1	02/14	UF	CS	0.01	0.03		
PM-1	06/20	UF	CS	0.04	0.05	0.15	
PM-1	08/14	UF	CS	–0.02	0.12	0.20	
PM-1	08/14	UF	CS	–0.04	0.05		

Table 5-29. Special Regional Aquifer Sampling for Strontium-90 During 2000[a] (Cont.)

Station Name	Date	Codes[b]		Result	Uncertainty	MDA	Detect?[c]
PM-1	11/15	UF	CS	–0.07	0.05	0.17	
PM-2	02/14	UF	CS	0.00	0.04		
PM-2	06/20	UF	CS	0.13	0.05	0.16	
PM-2	08/14	UF	CS	–0.07	0.21	0.37	
PM-2	08/14	UF	CS	0.11	0.15	0.24	
PM-2	08/14	UF	CS	0.03	0.05		
PM-2	11/15	UF	CS	–0.05	0.06	0.20	
PM-3	06/21	UF	CS	0.10	0.04	0.13	
PM-3	06/21	UF	RE	0.01	0.04	0.12	
PM-3	08/14	UF	CS	0.09	0.23	0.39	
PM-3	08/14	UF	CS	-0.12	0.13	0.22	
PM-3	08/14	UF	CS	0.05	0.05		
PM-3	11/15	UF	CS	-0.02	0.04	0.15	
PM-4	06/21	UF	CS	0.09	0.04	0.13	
PM-4	06/21	UF	RE	0.05	0.03	0.10	
PM-4	08/03	UF	CS	-0.11	0.05	0.16	
PM-4	08/03	UF	CS	0.22	0.40	0.68	
PM-4	08/14	UF	CS	0.09	0.23	0.39	
PM-4	08/14	UF	CS	–0.17	0.16	0.28	
PM-4	08/14	UF	CS	–0.02	0.04		
PM-4	11/15	UF	CS	–0.03	0.06	0.21	
PM-5	02/14	UF	CS	0.03	0.04		
PM-5	06/20	UF	CS	0.06	0.04	0.13	
PM-5	08/14	UF	CS	0.06	0.22	0.36	
PM-5	08/14	UF	CS	–1.22	0.14	0.21	
PM-5	08/14	UF	CS	–0.02	0.05		
PM-5	08/14	UF	DUP	0.10	0.06		
PM-5	11/15	UF	CS	0.04	0.06	0.20	
G-1A	03/07	UF	CS	0.02	0.04	0.13	
G-1A	08/14	UF	CS	0.02	0.22	0.38	
G-1A	08/14	UF	CS	–0.02	0.15	0.26	
G-1A	08/14	UF	CS	0.03	0.04		
G-1A	11/15	UF	CS	0.14	0.07	0.23	
G-1A	11/15	UF	DUP	0.03	0.05	0.16	
G-2A	03/07	UF	CS	0.03	0.04	0.13	
G-2A	03/07	UF	DUP	0.03	0.04	0.13	
G-2A	06/20	UF	CS	0.05	0.04	0.13	
G-2A	08/14	UF	CS	–0.07	0.22	0.38	
G-2A	08/14	UF	CS	0.05	0.17	0.28	
G-2A	08/14	UF	CS	–0.04	0.04		
G-2A	11/15	UF	CS	0.00	0.07	0.24	
G-3A	03/06	UF	CS	0.01	0.04	0.12	
G-3A	06/20	UF	CS	0.17	0.04	0.13	Detect
G-3A	06/20	UF	RE	–0.01	0.03	0.10	
G-3A	08/03	UF	CS	0.07	0.33	0.56	
G-3A	08/03	UF	DUP	0.04	0.20	0.34	
G-3A	08/03	UF	CS	0.01	0.04	0.14	

Table 5-29. Special Regional Aquifer Sampling for Strontium-90 During 2000[a] (Cont.)

Station Name	Date	Codes[b]		Result	Uncertainty	MDA	Detect?[c]
G-3A	08/14	UF	CS	–0.09	0.22	0.39	
G-3A	08/14	UF	CS	–0.04	0.15	0.26	
G-3A	08/14	UF	CS	0.02	0.04		
G-3A	11/15	UF	CS	–0.09	0.05	0.19	
G-4A	03/06	UF	CS	0.01	0.04	0.13	
G-4A	06/20	UF	CS	0.00	0.04	0.13	
G-4A	08/14	UF	CS	0.03	0.12	0.21	
G-4A	08/14	UF	DUP	–0.06	0.16	0.27	
G-4A	08/14	UF	CS	0.06	0.22	0.37	
G-4A	08/15	UF	CS	–0.05	0.04		
G-4A	11/15	UF	CS	–0.01	0.05	0.19	
G-4A	11/15	UF	CS	–0.07	0.07	0.24	
Water Quality Standards[d]							
DOE DCG for Public Dose				1,000			
DOE Drinking Water System DCG				40			
EPA Primary Drinking Water Standard				8			

[a] Three columns are listed: the first is the analytical result, the second is the radioactive counting uncertainty (1 standard deviation), and the third is the analytical laboratory measurement-specific minimum detectable activity.

[b] Codes: UF–Unfiltered; F–Filtered; CS–Customer Sample; DUP–Laboratory Duplicate; RE–Reanalysis of Sample.

[c] Detection defined as value ≥ 3× uncertainty and ≥ detection limit.

[d] Standards given here for comparison only; see Appendix A.

Table 5-30. Special Water Supply Sampling for Tritium during 2000 (pCi/L)[a]

Sample Date	PM-1	PM-2	PM-3	PM-4	PM-5	O-1	O-4	G-1A	G-2A	G-3A	G-4A	G-5A
02/14	0.51 ± 0.29	–0.06 ± 0.29	OS[b]	OS	0.19 ± 0.29	OS	OS					
03/07								0.06 ± 0.29	0.00 ± 0.29	–0.29 ± 0.29	0.13 ± 0.29	OS
06/21			0.096 ± 0.32	–0.22 ± 0.29		38.00 ± 1.3	0.96 ± 0.29					OS
10/16						31.93 ± 0.96						
10/16						35.44 ± 1.28						
11/15						23.82 ± 0.80						
12/12						21.97 ± 0.77						
12/12						23.95 ± 0.80						

[a] Analyses done by University of Miami. Results ± one standard deviation counting uncertainity.
[b] OS = means that the well was out-of-service on that date.

Table 5-31. Chemical Quality of Groundwater in 2000 (mg/L[a])

Station Name	Date	Code[b]		SiO_2	Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+ NO_2-N
Regional Aquifer Wells															
Test Wells:															
Test Well 1	05/02	F	CS												
Test Well 1	05/02	UF	CS	46	49.6	9.8	4.2	16.9	36.7	23.7	<[f] 5	115	0.33	0.03	5.31
Test Well 1	07/07	UF	CS												
Test Well 1	07/07	UF	CS												
Test Well 2	05/03	F	CS												
Test Well 2	05/03	UF	CS	26	8.5	2.4	1.8	15.9	2.0	1.7	< 5	64	0.47	0.03	0.22
Test Well 3	05/03	F	CS												
Test Well 3	05/03	UF	CS	82	16.7	5.1	2.0	11.0	3.0	2.9	< 5	80	0.35	0.03	0.73
Test Well 3	05/03	F	CS												
Test Well 3	05/03	UF	CS	83	17.2	5.2	2.5	11.2	2.9	2.9	< 5	84	0.35	0.03	0.74
Test Well 4	05/02	F	CS												
Test Well 4	05/02	UF	CS	19	10.9	5.8	2.5	9.4	1.8	1.3	< 5	77	0.88	0.03	0.11
Test Well 8	05/02	F	CS												
Test Well 8	05/02	UF	CS	71	11.5	3.9	2.1	9.8	1.8	1.9	< 5	64	0.88	0.03	0.35
Test Well DT-5A	10/26	F	CS												
Test Well DT-5A	10/26	F	DUP												
Test Well DT-5A	10/26	F	TRP												
Test Well DT-5A	10/26	UF	CS	67	8.7	2.5	1.6	10.7	1.7	1.5	< 1	53	0.24	0.02	0.31
Test Well DT-5A	10/26	UF	DUP	68	8.7	2.5	1.6	10.9							
Test Well DT-5A	10/26	F	CS												
Test Well DT-5A	10/26	F	DUP												
Test Well DT-5A	10/26	UF	CS	67	8.7	2.5	1.6	10.8	1.6	1.4	< 1	50	0.24	< 0.02	0.30
Test Well DT-10	10/27	F	CS												
Test Well DT-10	10/27	F	DUP												
Test Well DT-10	10/27	UF	CS	64	11.7	3.6	1.3	10.8	1.6	1.3	< 1	66	0.26	< 0.02	0.23
Test Well DT-10	10/27	UF	DUP												
Water Supply Wells:															
O-1	08/14	F	CS												
O-1	08/14	UF	CS	75	20.3	3.1	3.3	21.4	6.3	6.8	< 5	98	0.36	0.06	1.48
O-1	08/14	F	CS												
O-1	08/14	UF	CS	76	20.5	3.1	3.1	21.2	6.3	6.8	< 5	88	0.36	0.06	1.48
O-4	08/14	F	CS												
O-4	08/14	UF	CS	95	22.2	8.2	2.8	18.5	7.5	5.4	< 5	109	0.28	0.06	0.43
PM-1	08/14	F	CS												
PM-1	08/14	UF	CS	83	27.1	6.6	3.3	18.7	6.1	5.1	< 5	115	0.26	0.06	0.52
PM-1	08/14	F	CS												
PM-1	08/14	UF	CS	75	20.5	3.1	3.4	21.2	6.3	6.8	< 5	86	0.35	0.06	1.48
PM-2	08/14	F	CS												

Table 5-31. Chemical Quality of Groundwater in 2000 (mg/L[a]) (Cont.)

Station Name	Date	Code[b]	SiO_2	Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+ NO_2-N
Regional Aquifer Wells (Cont.)														
Water Supply Wells: (Cont.)														
PM-2	08/14	UF CS	80	9.5	2.9	1.6	10.2	1.7	1.5	< 5	53	0.16	0.06	0.37
PM-3	08/14	F CS												
PM-3	08/14	UF CS	86	24.9	8.1	3.3	17.8	6.8	5.1	< 5	120	0.26	0.06	0.50
PM-4	08/14	F CS												
PM-4	08/14	UF CS	85	11.9	4.1	2.3	12.4	2.3	2.4	< 5	68	0.23	0.06	0.37
PM-5	08/14	F CS												
PM-5	08/14	UF CS	89	10.6	3.9	1.8	12.8	2.1	2.1	< 5	66	0.21	0.06	0.35
G-1A	08/14	F CS												
G-1A	08/14	UF CS	74	10.8	0.5	2.5	28.1	3.4	4.3	< 5	88	0.50	0.06	0.50
G-2A	08/14	F CS												
G-2A	08/14	UF CS	65	13.1	1.1	1.8	21.5	2.2	3.3	< 5	76	0.27	0.06	0.47
G-3A	08/14	F CS												
G-3A	08/14	UF CS	52	15.8	2.5	1.3	14.1	2.4	3.2	< 5	72	0.26	0.06	0.59
G-4A	08/14	F CS												
G-4A	08/14	UF CS	57	16.9	3.3	1.6	12.4	2.4	3.1	< 5	73	0.20	0.06	0.54
Regional Aquifer Springs														
White Rock Canyon Group I:														
Sandia Spring	09/25	F CS	52	50.3	4.5	4.4	19.7	5.6	2.6	2	165	0.60	< 0.02	0.11
Sandia Spring	09/25	F DUP												
Sandia Spring	09/25	UF CS												
Sandia Spring	09/25	UF DUP												
Sandia Spring	09/25	UF TRP												
Spring 3	09/25	UF CS												
Spring 3A	09/25	F CS	53	21.8	1.8	2.9	16.1	3.4	4.3	< 1	76	0.44	< 0.02	1.00
Spring 3A	09/25	F DUP												
Spring 3A	09/25	UF CS												
Spring 4	09/25	F CS	55	22.9	4.3	2.6	14.2	6.2	9.3	< 1	77	0.49	< 0.02	1.34
Spring 4	09/25	F DUP												
Spring 4	09/25	UF CS												
Spring 4	09/25	UF DUP												
Spring 4A	09/25	F CS	73	20.4	4.5	2.1	12.9	4.6	5.3	< 1	79	0.45	< 0.02	0.93
Spring 4A	09/25	F DUP												
Spring 4A	09/25	UF CS												
Ancho Spring	09/26	F CS	81	13.0	3.0	1.9	11.1	1.9	2.2	< 1	57	0.36	< 0.02	0.37
Ancho Spring	09/26	F DUP								< 1	58			
Ancho Spring	09/26	UF CS												
Ancho Spring	09/26	UF DUP												

Table 5-31. Chemical Quality of Groundwater in 2000 (mg/L[a]) (Cont.)

Station Name	Date	Code[b]		SiO_2	Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+ NO_2-N
Regional Aquifer Springs (Cont.)															
White Rock Canyon Group II:															
Spring 5A	09/26	F	CS	58	26.4	2.4	2.9	22.2	4.1	6.8	< 1	109	0.39	< 0.02	0.26
Spring 5A	09/26	F	DUP												
Spring 5A	09/26	UF	CS												
Spring 5A	09/26	UF	DUP												
Spring 5B	07/26	F	CS	66	17.6	4.0	2.1	13.2	3.1	3.8	< 1	71	0.49	< 0.02	1.05
Spring 5B	07/26	F	DUP												
Spring 5B	07/26	F	TRP												
Spring 5B	07/26	UF	CS												
Spring 5B	07/26	UF	DUP												
Spring 6	09/26	F	CS	78	12.5	3.5	1.9	11.2	2.1	2.3	< 1	60	0.36	< 0.02	0.39
Spring 6	09/26	F	DUP												
Spring 6	09/26	UF	CS												
Spring 6	09/26	UF	DUP												
Spring 6	09/26	F	CS	77	12.5	3.5	1.9	11.1	2.1	2.2	< 1	60	0.36	< 0.02	0.39
Spring 6	09/26	F	DUP												
Spring 6	09/26	F	TRP												
Spring 6	09/26	UF	CS												
Spring 6	09/26	UF	DUP												
Spring 8A	09/26	F	CS	87	14.8	3.3	1.9	13.2	2.1	2.3	< 1	75	0.45	< 0.02	0.14
Spring 8A	09/26	F	DUP												
Spring 8A	09/26	UF	CS												
Spring 8A	09/26	UF	DUP												
Spring 9A	09/27	F	CS	73	11.6	3.2	1.4	11.4	2.0	1.9	< 1	55	0.48	0.02	0.32
Spring 9A	09/27	F	DUP	74	11.8	3.3	1.5	11.1	2.0	2.0				0.02	
Spring 9A	09/27	F	TRP												
Spring 9A	09/27	UF	CS												
Spring 9A	09/27	UF	DUP												
Spring 9A	09/27	UF	TRP												
Doe Spring	09/27	F	CS	78	12.3	3.3	1.5	12.5	1.8	1.8	< 1	63	0.50	< 0.02	0.05
Doe Spring	09/27	F	DUP												
Doe Spring	09/27	UF	CS												
Doe Spring	09/27	UF	DUP												
Spring 10	09/27	F	CS	74	23.6	3.5	1.9	13.0	2.2	2.0	< 1	89	0.53	0.04	0.34
Spring 10	09/27	F	DUP												
Spring 10	09/27	UF	CS												
Spring 10	09/27	UF	DUP												
Spring 10	09/27	UF	TRP												

Table 5-31. Chemical Quality of Groundwater in 2000 (mg/L[a]) (Cont.)

Station Name	Date	Code[b]	SiO_2	Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+ NO_2-N
Regional Aquifer Springs (Cont.)														
White Rock Canyon Group III:														
Spring 1	09/25	F CS	35	16.8	1.0	2.1	28.5	3.0	6.5	< 1	97	0.52	0.08	0.37
Spring 1	09/25	F DUP		16.9	1.0	2.2	28.8	3.0	6.5	< 1	95	0.51		
Spring 1	09/25	UF CS												
Spring 1	09/25	UF DUP												
Spring 2	09/25	F CS	34	15.1	0.7	1.6	36.4	2.6	5.2	2	108	0.60	< 0.02	0.05
Spring 2	09/25	F DUP												
Spring 2	09/25	UF CS												
White Rock Canyon Group IV:														
La Mesita Spring	10/19	F CS	28	36.2	1.0	2.7	29.3	6.8	13.4	2	125	0.25	0.06	2.16
La Mesita Spring	10/19	F DUP												
La Mesita Spring	10/19	UF CS												
La Mesita Spring	10/19	UF DUP												
Other Springs:														
Sacred Spring	10/19	F CS	44	37.7	1.6	2.6	22.2	2.9	7.8	2	126	0.47	0.03	0.16
Sacred Spring	10/19	F DUP	43	37.0	1.6	2.5	21.7	2.8	7.7	2	129			
Sacred Spring	10/19	F TRP												
Sacred Spring	10/19	UF CS												
Sacred Spring	10/19	UF DUP												
Canyon Alluvial Groundwater Systems														
Acid/Pueblo Canyons:														
APCO-1	07/26	F CS	69	38.7	8.2	13.7	60.4	40.3	17.1	< 5	196	0.63	5.98	0.57
APCO-1	07/26	UF CS												
DP/Los Alamos Canyons:														
LAO-C	08/01	F CS	36					85.5	7.9	< 5	107	0.14	0.06	0.02
LAO-C	08/01	UF CS		33.7	7.3	4.6	48.2							
LAO-0.7	08/01	UF CS												
LAO-2	06/26	F CS	58	17.0	4.5	4.6	29.0	25.2	12.9	< 5	78	0.62	0.19	1.23
LAO-2	06/26	UF CS												
LAO-3A	06/26	F CS	59	16.4	3.8	5.2	29.3	18.5	13.9	< 5	80	0.77	0.21	1.17
LAO-3A	06/26	UF CS												
LAO-3A	06/26	UF CS												
LAO-4	08/01	F CS	52					18.5	19.6	< 5	106	0.50	0.07	0.10
LAO-4	08/01	UF CS		20.5	5.3	5.2	29.3							

Table 5-31. Chemical Quality of Groundwater in 2000 (mg/L[a]) (Cont.)

Station Name	Date	Code[b]		SiO_2	Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+ NO_2-N
Canyon Alluvial Groundwater Systems (Cont.)															
Mortandad Canyon:															
MCO-2	07/17	F	CS	83	28.7	6.8	3.9	36.1	4.6	1.3	< 5	175	0.88	0.43	0.03
MCO-2	07/17	UF	CS												
MCO-3	07/17	F	CS	48	31.7	1.6	7.3	92.1	5.9	18.7	< 5	182	0.81	0.21	3.32
MCO-3	07/17	UF	CS												
MCO-5	07/07	UF	CS		41.0	3.5	16.0	55.0						0.10	5.70
MCO-5	07/07	F	CS		42.0	3.5	16.0	53.0	13.0	76.0		150	0.93	0.10	6.10
MCO-6	07/10	UF	CS		18.3	1.7	8.1	29.3						< 0.10	6.60
MCO-6	07/10	F	CS		44.9	4.2	17.7	59.1	13.0	80.0	< 10	140	1.20	< 0.10	6.60
MCO-6	07/10	UF	CS												
MCO-6	07/10	F	CS		47.5	4.3	17.4	58.3	13.0	83.0	< 10	140	1.20	< 0.10	6.70
MCO-7	07/10	UF	CS		15.6	3.5	9.6	38.3						0.27	9.50
MCO-7	07/10	F	CS		33.8	7.4	19.2	73.0	15.0	77.0	< 10	150	1.40	0.23	9.70
MCO-7.5	07/11	UF	CS		29.2	7.2	7.8	83.9						< 10.00	18.00
MCO-7.5	07/11	F	CS		30.4	7.2	7.8	84.9	19.0	29.0	< 10	170	1.40	< 10.00	18.00
Cañada del Buey:															
CDBO-6	12/12	F	CS												0.10
CDBO-6	12/12	F	DUP												
CDBO-6	12/12	UF	CS						17.9	7.9			0.19		
CDBO-6	12/12	UF	DUP												
Intermediate Perched Groundwater Systems															
Pueblo/Los Alamos/Sandia Canyon Area Perched System in Conglomerates and Basalt:															
POI-4	07/19	F	CS												
POI-4	07/19	UF	CS	57	43.1	10.5	7.4	39.4	42.3	23.0	< 5	160	0.32	1.24	3.12
Basalt Spring	07/25	F	CS	62	30.7	7.6	8.3	53.1	32.4	38.0	< 5	133	0.36	2.84	16.20
Basalt Spring	07/25	UF	CS												
Perched Groundwater System in Volcanics:															
Water Canyon Gallery	08/15	F	CS												
Water Canyon Gallery	08/15	UF	CS	47	8.1	3.7	1.7	5.8	1.0	1.8	< 5	45	0.03	0.06	0.33

Table 5-31. Chemical Quality of Groundwater in 2000 (mg/L[a]) (Cont.)

Station Name	Date	Code[b]		SiO_2	Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+ NO_2-N
San Ildefonso Pueblo:															
LA-5	12/06	UF	CS												
LA-5	12/06	UF	DUP												
LA-5	12/06	UF	CS												
Eastside Artesian Well	04/05	F	CS												
Eastside Artesian Well	04/05	UF	CS	6	2.7	0.1	0.7	88.1	3.3	19.2	18	190	0.73	0.03	2.00
Pajarito Well (Pump 1)	11/29	F	CS												
Pajarito Well (Pump 1)	11/29	F	DUP												
Pajarito Well (Pump 1)	11/29	UF	CS	31	40.3	4.0	3.8	285.0	145.0	48.1	2	442	1.19	< 0.02	0.44
Pajarito Well (Pump 1)	11/29	UF	DUP	33	43.7	4.3	4.0	286.0	142.0	48.1	2	449	1.15	< 0.02	
Don Juan Playhouse Well	04/05	F	CS												
Don Juan Playhouse Well	04/05	UF	CS	26	6.2	0.3	1.2	65.5	3.0	16.3	11	144	0.52	0.03	1.00
Otowi House Well	12/06	UF	CS												
New Community Well	11/29	F	CS												
New Community Well	11/29	F	DUP												
New Community Well	11/29	UF	CS	25	17.6	1.0	1.0	82.9	8.7	36.6	4	176	0.15	< 0.02	0.01
New Community Well	11/29	F	CS												
New Community Well	11/29	F	DUP												
New Community Well	11/29	F	TRP												
New Community Well	11/29	UF	CS	25	19.1	1.1	1.0	82.6	8.8	36.7	4	178	0.14	< 0.02	0.43
Sanchez House Well	04/05	F	CS												
Sanchez House Well	04/05	UF	CS	40	21.9	1.3	1.5	78.0	33.1	30.7	< 5	158	1.05	0.03	0.07
Sanchez House Well	04/05	F	CS												
Sanchez House Well	04/05	UF	CS	40	21.2	1.3	1.3	77.6	33.1	30.7	< 5	165	1.07	0.03	0.97
Water Quality Standards[g]															
EPA Primary Drinking Water Standard										500			4		10
EPA Secondary Drinking Water Standard									250	250					
EPA Health Advisory								20							
NMWQCC Groundwater Limit									250	600			2		10

Table 5-31. Chemical Quality of Groundwater in 2000 (mg/L[a]) (Cont.)

Station Name	Date	Code[b]		ClO_4 (µg/L)	CN (amen)	CN (Total)	TDS[c]	TSS[d]	Hardness as $CaCO_3$	Field pH[e]	Lab pH[e]	Conductance (µS/cm)
Regional Aquifer Wells												
Test Wells:												
Test Well 1	05/02	F	CS				230					
Test Well 1	05/02	UF	CS	< 4.00		0.0300		1.00	164.4	7.9	7.3	409
Test Well 1	07/07	UF	CS	< 1.00								
Test Well 1	07/07	UF	CS	2.80								
Test Well 2	05/03	F	CS				48					
Test Well 2	05/03	UF	CS	< 4.00		0.0100		4.00	31.1	7.7	7.9	119
Test Well 3	05/03	F	CS				168					
Test Well 3	05/03	UF	CS	< 4.00		0.0100		1.00	62.8	7.4	7.7	160
Test Well 3	05/03	F	CS				156					
Test Well 3	05/03	UF	CS	< 4.00		0.0100		1.00	64.5		7.6	162
Test Well 4	05/02	F	CS				134					
Test Well 4	05/02	UF	CS	< 4.00		0.0100		1.00	51.2	8.0	7.7	127
Test Well 8	05/02	F	CS				144					
Test Well 8	05/02	UF	CS	< 4.00		0.0100		1.00	44.7	7.9	7.6	129
Test Well DT-5A	10/26	F	CS				128					
Test Well DT-5A	10/26	F	DUP				129					
Test Well DT-5A	10/26	F	TRP				131					
Test Well DT-5A	10/26	UF	CS	< 1.04	< 0.0028	< 0.0028		< 1.17	32.0			104
Test Well DT-5A	10/26	UF	DUP		< 0.0028	< 0.0028		< 1.17				103
Test Well DT-5A	10/26	F	CS				129					
Test Well DT-5A	10/26	F	DUP				128					
Test Well DT-5A	10/26	UF	CS	< 1.04	< 0.0028	< 0.0028		< 0.78	32.0	7.1		105
Test Well DT-10	10/27	F	CS				133					
Test Well DT-10	10/27	F	DUP				136					
Test Well DT-10	10/27	UF	CS	< 1.04	< 0.0028	< 0.0028		< 0.78	43.9	8.4		119
Test Well DT-10	10/27	UF	DUP					0.89				
Water Supply Wells:												
O-1	08/14	F	CS				154					
O-1	08/14	UF	CS	2.40		0.0300		1.00	63.4	6.9	7.8	203
O-1	08/14	F	CS				144					
O-1	08/14	UF	CS			0.0300		1.00	64.0		7.9	206
O-4	08/14	F	CS				150					
O-4	08/14	UF	CS			0.0300		1.00	89.4	7.9	7.6	236
PM-1	08/14	F	CS				198					
PM-1	08/14	UF	CS			0.0300		1.00	94.7		7.9	227
PM-1	08/14	F	CS				170					
PM-1	08/14	UF	CS			0.0300		1.00	63.9	7.5	8.3	205
PM-2	08/14	F	CS				112					

Table 5-31. Chemical Quality of Groundwater in 2000 (mg/L[a]) (Cont.)

Station Name	Date	Code[b]	ClO_4 (µg/L)	CN (amen)	CN (Total)	TDS[c]	TSS[d]	Hardness as $CaCO_3$	Field pH[e]	Lab pH[e]	Conductance (µS/cm)
Regional Aquifer Wells (Cont.)											
Water Supply Wells: (Cont.)											
PM-2	08/14	UF CS			0.0300		1.00	35.7	6.9	8.2	107
PM-3	08/14	F CS				200					
PM-3	08/14	UF CS			0.0300		1.00	95.5	6.9	8.1	234
PM-4	08/14	F CS				90					
PM-4	08/14	UF CS			0.0300		1.00	46.6	6.9	8.1	133
PM-5	08/14	F CS				136					
PM-5	08/14	UF CS			0.0600		1.00	42.4	7.2	8.1	129
G-1A	08/14	F CS				162					
G-1A	08/14	UF CS			0.0300		1.00	29.0	7.2	8.4	165
G-2A	08/14	F CS				106					
G-2A	08/14	UF CS			0.0300		1.00	37.1	6.8	8.4	150
G-3A	08/14	F CS				98					
G-3A	08/14	UF CS			0.0300		1.00	49.9	6.9	8.4	150
G-4A	08/14	F CS				110					
G-4A	08/14	UF CS			0.0300		1.00	55.7	6.8	8.4	90
Regional Aquifer Springs											
White Rock Canyon Group I:											
Sandia Spring	09/25	F CS				259		144.0			260
Sandia Spring	09/25	F DUP				529					
Sandia Spring	09/25	UF CS	< 1.04	< 0.0028	< 0.0028		87.10		7.3		
Sandia Spring	09/25	UF DUP					95.00				
Sandia Spring	09/25	UF TRP					92.90				
Spring 3	09/25	UF CS	< 1.04						7.7		
Spring 3A	09/25	F CS				146		61.5			140
Spring 3A	09/25	F DUP				149					
Spring 3A	09/25	UF CS	< 1.04	< 0.0028	< 0.0028		< 1.40		7.6		
Spring 4	09/25	F CS				181		79.6			161
Spring 4	09/25	F DUP				237					
Spring 4	09/25	UF CS	8.49	< 0.0028	< 0.0028		28.80		7.1		
Spring 4	09/25	UF DUP					38.80				
Spring 4A	09/25	F CS				171		69.2			138
Spring 4A	09/25	F DUP				180					
Spring 4A	09/25	UF CS	< 1.04	< 0.0028	< 0.0028		< 1.40		8.0		
Ancho Spring	09/26	F CS				148		44.7			101
Ancho Spring	09/26	F DUP				155					
Ancho Spring	09/26	UF CS	< 1.04	< 0.0028	< 0.0028		10.00		7.2		
Ancho Spring	09/26	UF DUP					12.00				

Table 5-31. Chemical Quality of Groundwater in 2000 (mg/L[a]) (Cont.)

Station Name	Date	Code[b]		ClO_4 (µg/L)	CN (amen)	CN (Total)	TDS[c]	TSS[d]	Hardness as $CaCO_3$	Field pH[e]	Lab pH[e]	Conductance (µS/cm)
Regional Aquifer Springs (Cont.)												
White Rock Canyon Group II:												
Spring 5A	09/26	F	CS				184		77.9			187
Spring 5A	09/26	F	DUP				199					
Spring 5A	09/26	UF	CS	< 1.04	< 0.0028	< 0.0028		22.40		7.6		
Spring 5A	09/26	UF	DUP		< 0.0028	< 0.0028		24.40				
Spring 5B	07/26	F	CS				151		60.7			127
Spring 5B	07/26	F	DUP				172					
Spring 5B	07/26	F	TRP				154					
Spring 5B	07/26	UF	CS	< 1.04	< 0.0028	< 0.0028		11.60		8.3		
Spring 5B	07/26	UF	DUP					14.80				
Spring 6	09/26	F	CS				126		46.7			102
Spring 6	09/26	F	DUP				156					
Spring 6	09/26	UF	CS	< 1.04	< 0.0028	< 0.0028		2.80		7.5		
Spring 6	09/26	UF	DUP					5.60				
Spring 6	09/26	F	CS				142		46.7			105
Spring 6	09/26	F	DUP				168					
Spring 6	09/26	F	TRP				151					
Spring 6	09/26	UF	CS	< 1.04	< 0.0028	< 0.0028		10.40		7.5		
Spring 6	09/26	UF	DUP					8.80				
Spring 8A	09/26	F	CS				187		53.2			113
Spring 8A	09/26	F	DUP				188					
Spring 8A	09/26	UF	CS	< 1.04	< 0.0028	< 0.0028		< 1.40				
Spring 8A	09/26	UF	DUP					2.00				
Spring 9A	09/27	F	CS				127		37.9			102
Spring 9A	09/27	F	DUP				130					
Spring 9A	09/27	F	TRP				130					
Spring 9A	09/27	UF	CS	< 1.04	< 0.0028	< 0.0028		8.00		7.2		
Spring 9A	09/27	UF	DUP		< 0.0028	< 0.0028		9.60				
Spring 9A	09/27	UF	TRP					9.60				
Doe Spring	09/27	F	CS				124		45.4			101
Doe Spring	09/27	F	DUP				148					
Doe Spring	09/27	UF	CS	< 1.04	< 0.0028	< 0.0028		4.62		8.0		
Doe Spring	09/27	UF	DUP					5.00				
Spring 10	09/27	F	CS				183		75.0			144
Spring 10	09/27	F	DUP				175					143
Spring 10	09/27	UF	CS	< 1.04	< 0.0028	< 0.0028		1,350.00		7.7		
Spring 10	09/27	UF	DUP					1,590.00				
Spring 10	09/27	UF	TRP					1,370.00				

Table 5-31. Chemical Quality of Groundwater in 2000 (mg/L[a]) (Cont.)

Station Name	Date	Code[b]		ClO_4 (µg/L)	CN (amen)	CN (Total)	TDS[c]	TSS[d]	Hardness as $CaCO_3$	Field pH[e]	Lab pH[e]	Conductance (µS/cm)
Regional Aquifer Springs (Cont.)												
White Rock Canyon Group III:												
Spring 1	09/25	F	CS				152		46.1			159
Spring 1	09/25	F	DUP				162					156
Spring 1	09/25	UF	CS	< 1.04	< 0.0028	< 0.0028		8.75		7.9		
Spring 1	09/25	UF	DUP		< 0.0028	< 0.0028						
Spring 2	09/25	F	CS				151		40.8			172
Spring 2	09/25	F	DUP				158					
Spring 2	09/25	UF	CS	< 1.04	< 0.0028	< 0.0028		< 1.40		8.5		
White Rock Canyon Group IV:												
La Mesita Spring	10/19	F	CS				201		94.3			291
La Mesita Spring	10/19	F	DUP				202					291
La Mesita Spring	10/19	UF	CS	< 1.04	< 0.0028	< 0.0028		366.00		7.7		
La Mesita Spring	10/19	UF	DUP					400.00				
Other Springs:												
Sacred Spring	10/19	F	CS				196		101.0			269
Sacred Spring	10/19	F	DUP				199					
Sacred Spring	10/19	F	TRP				198					
Sacred Spring	10/19	UF	CS	< 1.04	< 0.0028	< 0.0028		39.00		7.6		
Sacred Spring	10/19	UF	DUP					62.00				
Canyon Alluvial Groundwater Systems												
Acid/Pueblo Canyons:												
APCO-1	07/26	F	CS				416		130.6		7.3	507
APCO-1	07/26	UF	CS	< 1.00		0.0100		1.00		7.8		
DP/Los Alamos Canyons:												
LAO-C	08/01	F	CS				308				7.7	473
LAO-C	08/01	UF	CS	< 1.00		0.0600		1.00		7.2		
LAO-0.7	08/01	UF	CS	< 1.00		0.0100		6.00		6.9		
LAO-2	06/26	F	CS				220		61.0		7.0	230
LAO-2	06/26	UF	CS	< 4.00		0.0100		2.00		7.0		
LAO-3A	06/26	F	CS				246		56.5		7.2	222
LAO-3A	06/26	UF	CS	< 4.00		0.0100		1.00				
LAO-3A	06/26	UF	CS	< 4.00						6.9		
LAO-4	08/01	F	CS				208				7.1	279
LAO-4	08/01	UF	CS	< 1.00		0.0500		1.00		7.5		

Table 5-31. Chemical Quality of Groundwater in 2000 (mg/L[a]) (Cont.)

Station Name	Date	Code[b]	ClO_4 (µg/L)	CN (amen)	CN (Total)	TDS[c]	TSS[d]	Hardness as $CaCO_3$	Field pH[e]	Lab pH[e]	Conductance (µS/cm)
Canyon Alluvial Groundwater Systems (Cont.)											
Mortandad Canyon:											
MCO-2	07/17	F CS				338		99.6		6.8	324
MCO-2	07/17	UF CS	< 1.00		0.0100		6.00		6.8		
MCO-3	07/17	F CS	120.00			416		85.9		7.5	526
MCO-3	07/17	UF CS			0.0100		1.00		7.4		
MCO-5	07/07	UF CS	252.00		< 0.0100				7.2		290
MCO-5	07/07	F CS				360					290
MCO-6	07/10	UF CS	268.00		0.0024				7.2		340
MCO-6	07/10	F CS				390					340
MCO-6	07/10	UF CS			0.0019				7.2		340
MCO-6	07/10	F CS									340
MCO-7	07/10	UF CS	282.00		0.0016				8.1		360
MCO-7	07/10	F CS				440					360
MCO-7.5	07/11	UF CS	252.00		0.0014						
MCO-7.5	07/11	F CS				420					
Cañada del Buey:											
CDBO-6	12/12	F CS				169					
CDBO-6	12/12	F DUP				173					
CDBO-6	12/12	UF CS			< 0.0028						
CDBO-6	12/12	UF DUP			< 0.0028						
Intermediate Perched Groundwater Systems											
Pueblo/Los Alamos/Sandia Canyon Area Perc hed System in Conglomerates and Basalt:											
POI-4	07/19	F CS				338					
POI-4	07/19	UF CS	< 1.00		0.0100		1.00	151.0	8.2	7.9	432
Basalt Spring	07/25	F CS				418		108.2		7.3	459
Basalt Spring	07/25	UF CS	< 1.00		0.0100		1.00		6.7		
Perched Groundwater System in Volcanics:											
Water Canyon Gallery	08/15	F CS				60					
Water Canyon Gallery	08/15	UF CS	< 1.04		0.0300		1.00	35.5	7.0	8.4	152

Table 5-31. Chemical Quality of Groundwater in 2000 (mg/L[a]) (Cont.)

Station Name	Date	Code[b]	ClO_4 (µg/L)	CN (amen)	CN (Total)	TDS[c]	TSS[d]	Hardness as $CaCO_3$	Field pH[e]	Lab pH[e]	Conductance (µS/cm)
San Ildefonso Pueblo:											
LA-5	12/06	UF CS							8.4		
LA-5	12/06	UF DUP					< 1.08				
LA-5	12/06	UF CS							8.6		
Eastside Artesian Well	04/05	F CS				296					
Eastside Artesian Well	04/05	UF CS	< 4.00		0.0200		1.00	7.2	9.0	8.7	356
Pajarito Well (Pump 1)	11/29	F CS				821					
Pajarito Well (Pump 1)	11/29	F DUP				838					
Pajarito Well (Pump 1)	11/29	UF CS	2.46	< 0.0028	< 0.0028		< 1.40	117.0	7.7		1,220
Pajarito Well (Pump 1)	11/29	UF DUP		< 0.0028	< 0.0028		< 1.40				1,210
Don Juan Playhouse Well	04/05	F CS				56					
Don Juan Playhouse Well	04/05	UF CS	< 4.00		0.0200		1.00	16.8	8.7	8.9	262
Otowi House Well	12/06	UF CS							7.2		
New Community Well	11/29	F CS				289					
New Community Well	11/29	F DUP				291					
New Community Well	11/29	UF CS	1.69	< 0.0028	< 0.0028		< 0.87	48.1	8.6		416
New Community Well	11/29	F CS				288					
New Community Well	11/29	F DUP				292					
New Community Well	11/29	F TRP				297					
New Community Well	11/29	UF CS	< 1.04	< 0.0028	< 0.0028		< 0.87	52.2	8.6		399
Sanchez House Well	04/05	F CS				362					
Sanchez House Well	04/05	UF CS	< 4.00		0.0200		1.00	60.2		7.8	383
Sanchez House Well	04/05	F CS				284					
Sanchez House Well	04/05	UF CS	< 4.00		0.0300		1.00	58.2	7.9	8.5	393
Water Quality Standards[g]											
EPA Primary Drinking Water Standard					0.2						
EPA Secondary Drinking Water Standard						500			6.8-8.5	6.8-8.5	
EPA Health Advisory											
NMWQCC Groundwater Limit					0.2	1,000			6-9	6-9	

[a] Except where noted.
[b] Codes: UF–Unfiltered; F–Filtered; CS–Customer Sample; DUP–Laboratory Duplicate; TRP–Laboratory Triplicate.
[c] Total dissolved solids.
[d] Total suspended solids.
[e] Standard units.
[f] Less than symbol (<) means measurement was below the specified limit of detection of the analytical method.
[g] Standards given here for comparison only; see Appendix A.

Table 5-32. Trace Metals in Groundwater for 2000 (μg/L)

Station Name	Date	Codes[a]		Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe	Hg
Regional Aquifer Wells															
Test Wells:															
Test Well 1	05/02	UF	CS	<[b] 6.0	< 40.0	< 3.0	90.0	81.0	< 1.00	< 3.0	8.0	< 5.0	< 4.0	402.0	< 0.10
Test Well 2	05/03	UF	CS	< 7.0	394.0	< 2.0	27.0	28.0	3.00	< 3.0	9.0	< 5.0	7.0	2,566.0	< 0.10
Test Well 3	05/03	UF	CS	< 6.0	< 40.0	< 2.0	36.0	24.0	< 1.00	< 3.0	13.0	< 5.0	< 4.0	190.0	< 0.10
Test Well 3	05/03	UF	CS	< 6.0	< 40.0	< 2.0	41.0	23.0	< 1.00	< 3.0	8.0	< 5.0	< 4.0	62.0	< 0.10
Test Well 4	05/02	UF	CS	< 6.0	< 40.0	< 2.0	14.0	58.0	< 1.00	< 3.0	< 6.0	< 5.0	12.0	1,431.0	< 0.10
Test Well 8	05/02	UF	CS	< 6.0	< 40.0	< 2.0	< 12.0	6.0	< 1.00	< 3.0	< 6.0	< 5.0	< 4.0	< 40.0	< 0.10
Test Well DT-5A	10/26	UF	CS	< 0.5	11.7	< 2.6	14.9	22.8	< 0.47	< 0.6	< 0.6	1.6	< 1.8	64.1	< 0.06
Test Well DT-5A	10/26	UF	DUP	< 0.5	61.2	< 2.6	13.7	22.5	< 0.47	< 0.6	0.7	1.4	< 1.8	118.0	
Test Well DT-5A	10/26	UF	CS	< 0.5	20.5	< 2.6	20.0	22.5	< 0.47	< 0.6	5.0	1.3	< 1.8	65.5	< 0.06
Test Well DT-10	10/27	UF	CS	< 0.5	49.5	< 2.6	19.1	7.0	< 0.47	< 0.6	0.8	3.7	< 1.8	145.0	< 0.06
Regional Aquifer Springs															
White Rock Canyon Group I:															
Spring 3A	09/25	F	CS	< 0.5	18.6	< 2.6	13.3	32.5	< 0.47	< 0.6	4.1	3.6	< 1.8	< 19.9	< 0.06
Spring 4	09/25	F	CS	< 0.5	< 23.4	< 2.6	9.7	40.8	< 0.47	< 0.6	< 0.6	3.0	< 1.8	< 19.9	< 0.06
Ancho Spring	09/26	F	CS	< 0.5	9.7	< 2.6	< 4.7	28.1	< 0.47	< 0.6	1.2	3.4	< 1.8	< 19.9	< 0.06
White Rock Canyon Group II:															
Spring 5A	09/26	F	CS	< 0.5	18.5	< 2.6	30.1	46.9	< 0.47	< 0.6	< 0.6	2.1	< 1.8	23.1	< 0.06
Spring 5B	07/26	F	CS	< 0.5	9.1	< 2.6	14.3	33.2	< 0.47	< 0.6	3.0	4.8	< 1.8	< 19.9	< 0.06
Spring 5B	07/26	F	DUP												
Spring 6	09/26	F	CS	< 0.5	15.4	< 2.6	6.3	25.3	< 0.47	< 0.6	7.0	3.4	< 1.8	< 19.9	< 0.06
Spring 6	09/26	F	DUP												
Spring 6	09/26	F	CS	< 0.5	12.0	< 2.6	5.1	25.3	< 0.47	< 0.6	5.4	3.7	< 1.8	< 19.9	< 0.06
Spring 6	09/26	F	DUP												< 0.06
Spring 8A	09/26	F	CS	< 0.5	8.7	< 2.6	< 4.7	33.7	< 0.47	< 0.6	1.2	< 1.1	< 1.8	34.1	< 0.06
Spring 9A	09/27	F	CS	< 0.5	< 23.4	< 2.6	< 4.7	10.1	< 0.47	< 0.6	4.2	2.7	< 1.8	< 19.9	< 0.06
Spring 9A	09/27	F	DUP	< 0.5	< 23.4	< 2.6	< 4.7	10.2	< 0.47	< 0.6	4.4	2.5	< 1.8	< 19.9	
Doe Spring	09/27	F	CS	< 0.5	< 23.4	< 2.6	< 4.7	16.2	< 0.47	< 0.6	1.1	< 1.1	< 1.8	< 19.9	< 0.06
Spring 10	09/27	F	CS	< 0.5	19.9	2.7	4.0	61.7	< 0.47	< 0.6	1.8	< 1.1	< 1.8	130.0	< 0.06
White Rock Canyon Group III:															
Spring 1	09/25	F	DUP	< 0.5	27.8	4.0	41.4	27.3	< 0.47	< 0.6	6.4	4.8	< 1.8	< 19.9	

Table 5-32. Trace Metals in Groundwater for 2000 (μg/L) (Cont.)

Station Name	Date	Codes[a]		Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe	Hg
Canyon Alluvial Groundwater Systems															
Acid/Pueblo Canyons:															
APCO-1	07/26	UF	CS	< 6.0	< 438.0	9.0	329.0	68.0	< 1.00	< 3.0	< 6.0	< 5.0	< 4.0	731.0	< 0.10
APCO-1	07/26	F	CS	< 6.0	< 438.0	10.0	339.0	63.0	< 1.00	< 3.0	< 9.0	< 5.0	< 4.0	773.0	
DP/Los Alamos Canyons:															
LAO-C	08/01	UF	CS	< 6.0	75.0	< 2.0	22.0	127.0	< 1.00	< 3.0	< 6.0	< 5.0	47.0	54.0	< 0.10
LAO-2	06/26	UF	CS	< 6.0	917.0	< 2.0	< 75.0	42.0	2.00	< 3.0	11.0	9.0	< 4.0	462.0	< 0.00
LAO-2	06/26	F	CS	< 6.0	646.0	< 2.0	< 75.0	53.0	4.00	< 3.0	19.0	12.0	< 4.0	302.0	
LAO-3A	06/26	UF	CS	< 6.0	985.0	2.0	< 75.0	43.0	2.00	< 3.0	8.0	13.0	< 4.0	439.0	< 0.00
LAO-3A	06/26	F	CS	< 6.0	841.0	< 2.0	< 75.0	46.0	8.00	< 4.0	13.0	12.0	< 4.0	307.0	
LAO-4	08/01	UF	CS	< 6.0	208.0	< 2.0	36.0	60.0	< 1.00	< 3.0	< 6.0	< 5.0	33.0	137.0	< 0.10
Mortandad Canyon:															
MCO-2	07/17	UF	CS	8.0	129.0	15.0	36.0	155.0	< 1.00	< 3.0	< 6.0	17.0	< 4.0	16,041.0	< 0.10
MCO-2	07/17	F	CS	9.0	111.0	17.0	38.0	155.0	2.00	< 3.0	< 6.0	13.0	< 4.0	15,328.0	
MCO-3	07/17	UF	CS	< 9.0	263.0	< 4.0	91.0	26.0	< 1.00	< 3.0	< 6.0	< 7.0	< 4.0	167.0	0.10
MCO-3	07/17	F	CS	< 7.0	153.0	< 2.0	90.0	25.0	< 1.00	< 3.0	< 6.0	< 5.0	< 4.0	62.0	
MCO-5	07/07	UF	CS	< 0.4	75.0	< 3.4	110.0	110.0	0.04	0.3	< 0.3	1.5	< 0.3	86.0	< 0.01
MCO-5	07/07	F	CS	< 0.4	29.0	< 3.4	110.0	110.0	< 0.01	0.3	< 0.3	1.7	0.3	52.0	< 0.01
MCO-6	07/10	UF	CS	0.0	33.1	1.5	56.8	51.3	0.05	0.3	0.7	3.9	4.9	10.7	< 0.03
MCO-6	07/10	F	CS	0.0	43.7	0.8	123.0	109.0	0.04	0.3	0.3	1.8	2.9	< 7.9	< 0.03
MCO-6	07/10	F	CS	< 0.0	77.6	0.8	137.0	109.0	0.04	0.3	0.3	1.8	2.9	< 7.9	< 0.03
MCO-7	07/10	UF	CS	0.1	66.9	1.4	41.9	116.0	0.05	0.5	0.4	1.9	4.3	48.8	< 0.03
MCO-7	07/10	F	CS	0.0	< 31.5	1.3	83.1	224.0	0.04	0.4	0.3	1.9	3.2	15.3	< 0.03
MCO-7.5	07/11	UF	CS	0.0	880.0	0.9	79.0	172.0	0.16	0.3	0.5	2.8	2.4	761.0	< 0.03
MCO-7.5	07/11	F	CS	< 0.0	81.5	0.8	84.0	165.0	0.03	0.3	0.3	2.2	0.9	12.6	< 0.03
Cañada del Buey:															
CDBO-6	12/12	UF	CS	< 0.5		< 2.6		86.5		< 0.6		< 1.1	< 1.8	432.0	< 0.06
CDBO-6	12/12	UF	DUP	< 0.5		< 2.6		88.0		< 0.6		< 1.1	< 1.8	435.0	< 0.06
Intermediate Perched Groundwater Systems															
Pueblo/Los Alamos/Sandia Canyon Area Perched System in Conglomerates and Basalt:															
POI-4	07/19	UF	CS	< 6.0	< 270.0	3.0	211.0	89.0	< 1.00	< 3.0	< 6.0	< 5.0	< 4.0	57.0	< 0.02
Basalt Spring	07/25	F	CS	< 6.0	< 438.0	5.0	280.0	90.0	< 1.00	< 3.0	8.0	< 5.0	< 4.0	< 208.0	
Basalt Spring	07/25	UF	CS												< 0.10

Table 5-32. Trace Metals in Groundwater for 2000 (µg/L) (Cont.)

Station Name	Date	Codes[a]	Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe	Hg
San Ildefonso Pueblo:														
Eastside Artesian Well	04/05	UF CS	< 22.0	< 100.0	< 2.0	89.0	< 3.0	< 2.00	< 3.0	< 6.0	< 5.0	< 25.0	148.0	< 0.10
Pajarito Well (Pump 1)	11/29	UF CS	< 0.5	< 23.4	9.8	1,160.0	75.8	< 0.47	< 0.6	< 0.6	4.8	5.6	114.0	< 0.06
Pajarito Well (Pump 1)	11/29	UF DUP	< 0.5	< 23.4	12.5	1,230.0	80.2	< 0.47	< 0.6	< 0.6	5.1	5.9	123.0	< 0.06
Don Juan Playhouse Well	04/05	UF CS	< 22.0	< 100.0	4.0	43.0	< 3.0	< 2.00	< 3.0	10.0	< 11.0	< 25.0	< 30.0	< 0.10
New Community Well	11/29	UF CS	< 0.5	< 23.4	3.1	47.9	15.6	< 0.47	< 0.6	< 0.6	1.0	2.5	< 19.9	< 0.06
New Community Well	11/29	UF CS	< 0.5	< 23.4	< 2.6	39.1	17.6	< 0.47	< 0.6	< 0.6	1.5	2.5	4.3	< 0.06
Sanchez House Well	04/05	UF CS	44.0	< 100.0	14.0	158.0	64.0	< 2.00	< 3.0	< 6.0	< 5.0	< 25.0	< 30.0	< 0.10
Sanchez House Well	04/05	UF CS	< 22.0	< 100.0	13.0	162.0	62.0	< 2.00	< 3.0	< 6.0	< 5.0	< 25.0	< 30.0	< 0.10
Water Quality Standards[c]														
EPA Primary Drinking Water Standard					50		2,000	4	5		100			2
EPA Secondary Drinking Water Standard				50-200									300	
EPA Action Level												1,300		
EPA Health Advisory														
NMWQCC Livestock Watering Standard				5,000	200	5,000			50	1,000	1,000	500		10
NMWQCC Groundwater Limit			50	5,000	100	750	1,000		10	50	50	1,000	1,000	2
NMWQCC Wildlife Habitat Standard														0.77

Table 5-32. Trace Metals in Groundwater for 2000 (µg/L) (Cont.)

Station Name	Date	Codes[a]	Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn
Regional Aquifer Wells													
Test Wells:													
Test Well 1	05/02	UF CS	29.0	< 10.0	< 20.0	42.00	4.20	< 3.0	< 60.0	273.0		< 7.0	746.0
Test Well 2	05/03	UF CS	199.0	< 10.0	< 20.0	40.00	3.00	3.0	< 60.0	39.0		< 7.0	499.0
Test Well 3	05/03	UF CS	13.0	< 10.0	< 20.0	< 2.00	3.00	3.0	< 60.0	73.0		< 7.0	57.0
Test Well 3	05/03	UF CS	11.0	< 10.0	< 20.0	< 2.00	< 3.00	3.0	< 60.0	74.0		< 7.0	58.0
Test Well 4	05/02	UF CS	33.0	< 10.0	< 20.0	40.00	3.00	3.0	< 60.0	52.0		< 7.0	621.0
Test Well 8	05/02	UF CS	< 4.0	< 10.0	< 20.0	7.00	< 3.00	< 3.0	< 60.0	50.0		< 7.0	397.0
Test Well DT-5A	10/26	UF CS	9.5	2.0	1.7	< 1.83	0.18	< 2.4	< 2.0	44.0	0.27	8.0	259.0
Test Well DT-5A	10/26	UF DUP	10.3	< 1.1	1.6	< 1.83	< 0.11	< 2.4	< 2.0	44.6	0.08	8.3	287.0
Test Well DT-5A	10/26	UF CS	9.9	1.5	2.2	< 1.83	< 0.11	< 2.4	< 2.0	44.6	0.02	8.1	260.0
Test Well DT-10	10/27	UF CS	6.1	2.0	1.8	< 1.83	0.18	< 2.4	< 2.0	47.9	0.02	4.4	75.2
Regional Aquifer Springs													
White Rock Canyon Group I:													
Spring 3A	09/25	F CS	< 1.2	1.6	< 3.1	< 1.83	< 0.11	< 2.4	< 2.0	239.0	0.28	13.4	2.5
Spring 4	09/25	F CS	< 1.2	< 1.1	< 3.1	< 1.83	< 0.11	4.1	< 2.0	137.0	0.02	8.8	1.7
Ancho Spring	09/26	F CS	2.7	< 1.1	1.6	< 1.83	< 0.11	< 2.4	< 2.0	63.9	0.02	6.8	2.3
White Rock Canyon Group II:													
Spring 5A	09/26	F CS	53.6	2.0	< 3.1	< 1.83	< 0.11	< 2.4	< 2.0	175.0	0.02	10.4	1.2
Spring 5B	07/26	F CS	0.5	1.9	< 3.1	< 1.83	< 0.11	< 2.4	< 2.0	100.0	0.53	9.0	2.0
Spring 5B	07/26	F DUP					< 0.11				0.13		
Spring 6	09/26	F CS	< 1.2	< 1.1	1.5	< 1.83	< 0.11	3.7	< 2.0	63.9	0.02	7.2	1.9
Spring 6	09/26	F DUP						< 2.4					
Spring 6	09/26	F CS	0.5	< 1.1	1.8	< 1.83	< 0.11	< 2.4	< 2.0	63.6	0.02	7.3	2.2
Spring 6	09/26	F DUP											
Spring 8A	09/26	F CS	62.2	1.4	< 3.1	< 1.83	0.78	< 2.4	< 2.0	70.7	0.02	9.2	2.1
Spring 9A	09/27	F CS	< 1.2	1.6	1.3	< 1.83	< 0.68	< 2.4	< 2.0	52.9	0.35	8.1	< 3.9
Spring 9A	09/27	F DUP	< 1.2	< 1.1	< 3.1	< 1.83	< 0.11	< 2.4	< 2.0	53.8	< 0.01	8.0	< 3.9
Doe Spring	09/27	F CS	14.7	1.7	< 3.1	< 1.83	< 0.11	2.5	< 2.0	60.0	0.02	5.8	1.8
Spring 10	09/27	F CS	358.0	< 1.1	1.5	< 1.83	< 0.11	6.1	< 2.0	130.0	0.02	9.1	1.9
White Rock Canyon Group III:													
Spring 1	09/25	F DUP	< 1.2	3.2	1.7	< 1.83			< 2.0	215.0		16.2	1.5

Table 5-32. Trace Metals in Groundwater for 2000 (µg/L) (Cont.)

Station Name	Date	Codes[a]		Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn
Canyon Alluvial Groundwater Systems														
Acid/Pueblo Canyons:														
APCO-1	07/26	UF	CS	739.0	< 10.0	< 62.0	< 5.00	< 3.00	< 3.0	< 60.0	171.0		8.0	32.0
APCO-1	07/26	F	CS	842.0	< 10.0	< 20.0	< 2.00	3.00		< 60.0	169.0		7.0	23.0
DP/Los Alamos Canyons:														
LAO-C	08/01	UF	CS	1,904.0	< 16.0	< 20.0	< 2.00	< 3.00	< 3.0	< 60.0	213.0		< 7.0	12.0
LAO-2	06/26	UF	CS	7.0	950.0	< 20.0	< 2.00	< 3.00	3.0	66.0	110.0		< 7.0	15.0
LAO-2	06/26	F	CS	13.0	949.0	< 20.0	6.00	< 3.00		73.0	118.0		< 7.0	21.0
LAO-3A	06/26	UF	CS	13.0	1,720.0	< 20.0	< 5.00	< 3.00	< 3.0	< 60.0	103.0		< 7.0	21.0
LAO-3A	06/26	F	CS	7.0	1,702.0	< 20.0	< 2.00	3.00		62.0	107.0		< 7.0	14.0
LAO-4	08/01	UF	CS	5.0	404.0	< 20.0	< 5.00	< 3.00	< 3.0	< 60.0	133.0		< 7.0	< 10.0
Mortandad Canyon:														
MCO-2	07/17	UF	CS	2,375.0	355.0	< 20.0	< 2.00	< 3.00	3.0	< 60.0	154.0		< 7.0	< 10.0
MCO-2	07/17	F	CS	2,266.0	401.0	< 20.0	< 2.00	< 3.00		< 60.0	153.0		< 7.0	< 10.0
MCO-3	07/17	UF	CS	< 6.0	68.0	< 20.0	< 2.00	3.00	< 3.0	< 60.0	59.0		< 7.0	< 10.0
MCO-3	07/17	F	CS	< 1.0	71.0	< 20.0	< 2.00	3.00		< 60.0	60.0		< 7.0	< 10.0
MCO-5	07/07	UF	CS	1.4		8.9	0.12	< 0.68	< 2.6			0.14	< 0.3	3.6
MCO-5	07/07	F	CS	0.6		9.2	0.03	< 0.68	< 2.6			0.14	< 0.3	4.4
MCO-6	07/10	UF	CS	2.2		22.8	0.29	< 0.68	2.8			0.74	1.9	13.8
MCO-6	07/10	F	CS	0.5		12.5	0.21	< 0.68	1.4			1.02	1.1	19.5
MCO-6	07/10	F	CS	0.5		11.4	0.20	0.75	1.4			0.17	1.0	21.2
MCO-7	07/10	UF	CS	3.1		10.0	0.32	< 0.68	1.0			0.42	2.6	18.8
MCO-7	07/10	F	CS	1.2		10.6	0.08	< 0.68	1.1			0.31	2.6	20.2
MCO-7.5	07/11	UF	CS	23.0		8.6	0.99	< 0.68	1.3			0.13	3.2	20.0
MCO-7.5	07/11	F	CS	0.5		8.0	0.11	< 0.68	1.2			0.11	1.8	19.6
Cañada del Buey:														
CDBO-6	12/12	UF	CS	6.0			< 1.83		3.0					3.8
CDBO-6	12/12	UF	DUP	5.9			< 1.83		< 2.4					4.2
Intermediate Perched Groundwater Systems														
Pueblo/Los Alamos/Sandia Canyon Area Perched System in Conglomerates and Basalt:														
POI-4	07/19	UF	CS	< 2.0	< 10.0	< 20.0	< 2.00	< 3.00	< 3.0	< 60.0	209.0		< 7.0	< 10.0
Basalt Spring	07/25	F	CS	3.0	< 10.0	< 53.0	< 5.00	< 3.00		< 60.0	160.0		7.0	< 10.0
Basalt Spring	07/25	UF	CS						3.0					

Table 5-32. Trace Metals in Groundwater for 2000 (µg/L) (Cont.)

Station Name	Date	Codes[a]	Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn
San Ildefonso Pueblo:													
Eastside Artesian Well	04/05	UF CS	9.0	< 14.0	< 20.0	< 2.00	< 3.00	< 3.0	< 60.0	40.0		< 7.0	< 10.0
Pajarito Well (Pump 1)	11/29	UF CS	1.4	15.3	< 3.1	< 1.83	0.20	< 2.4	2.5	930.0	0.02	18.2	2.7
Pajarito Well (Pump 1)	11/29	UF DUP	1.3	14.4	< 3.1	< 1.83	0.20	< 2.4	< 2.0	1,010.0	< 0.01	19.6	3.0
Don Juan Playhouse Well	04/05	UF CS	< 3.0	< 10.0	< 20.0	< 2.00	< 3.00	< 3.0	< 60.0	88.0		14.0	< 10.0
New Community Well	11/29	UF CS	0.7	< 1.1	< 3.1	< 1.83	0.17	4.0	< 2.0	210.0	0.02	6.0	0.8
New Community Well	11/29	UF CS	3.2	< 1.1	< 3.1	< 1.83	0.17	3.6	< 2.0	226.0	0.02	5.6	2.6
Sanchez House Well	04/05	UF CS	< 3.0	< 10.0	< 20.0	< 2.00	3.00	< 3.0	< 75.0	219.0		16.0	< 10.0
Sanchez House Well	04/05	UF CS	< 3.0	10.0	< 20.0	< 2.00	< 3.00	< 3.0	< 60.0	213.0		18.0	< 10.0
Water Quality Standards[c]													
EPA Primary Drinking Water Standard					100		6	50			2		
EPA Secondary Drinking Water Standard			50										5,000
EPA Action Level						15							
EPA Health Advisory										25,000-90,000		80-110	
NMWQCC Livestock Watering Standard						100		50				100	25,000
NMWQCC Groundwater Limit			200	1,000	200	50		50					10,000
NMWQCC Wildlife Habitat Standard								5					

[a]Codes: UF–unfiltered; F–filtered; CS–customer sample; DUP–laboratory duplicate.

[b]Less than symbol (<) means measurement was below the specified limit of detection of the analytical method.

[c]Standards given here for comparison only; see Appendix A. Note that New Mexico Livestock Watering and Groundwater limits are based on dissolved concentrations, whereas many of these analyses are of unfiltered samples; thus, concentrations may include suspended sediment quantities.

Table 5-33. Special Water Supply Well Sampling for Perchlorate in 2000 (μg/L)

Station Name	Date	Codes[a]		Result	MDL[b]	Lab Qual Code[c]
O-1	06/21	UF	CS	3.50		
O-1	06/29	UF	CS	<4.00		U
O-1	07/06	UF	CS	3.50	1.00	J
O-1	07/06	UF	CS	2.00	1.00	J
O-1	08/03	UF	CS	<4.16	4.16	U
O-1	08/03	UF	CS	2.00	1.00	J
O-1	08/03	UF	CS	1.20	1.04	J
O-1	08/03	UF	DUP	1.58	1.04	J
O-1	08/03	UF	CS	2.30	1.00	J
O-1	08/14	UF	CS	2.40	1.00	J
O-1	08/14	UF	CS	<1.00	1.00	U
O-1	08/14	UF	CS	<4.16	4.16	U
O-1	09/12	UF	CS	1.90	1.00	J
O-1	09/12	UF	CS	2.40	1.00	J
O-1	10/10	UF	CS	<1.00	1.00	U
O-1	11/14	UF	CS	5.00	1.00	
O-1	12/12	UF	CS	<1.00	1.00	U
O-1	12/12	UF	CS	1.50	1.00	J
O-4	06/21	UF	CS	<4.00		U
O-4	11/15	UF	CS	<1.00	1.00	U
PM-1	02/14	UF	CS	<4.00		U
PM-1	11/15	UF	CS	<1.00	1.00	U
PM-1	11/15	UF	CS	<1.00	1.00	U
PM-2	02/15	UF	CS	<4.00		U
PM-2	11/15	UF	CS	<1.00	1.00	U
PM-3	06/21	UF	CS	<4.00		U
PM-3	06/29	UF	CS	<4.00		U
PM-3	06/29	UF	CS	<4.00		U
PM-3	11/15	UF	CS	<1.00	1.00	U
PM-4	06/21	UF	CS	<4.00		U
PM-4	06/29	UF	CS	<4.00		U
PM-4	08/03	UF	CS	<1.00	1.00	U
PM-4	08/03	UF	CS	<4.16	4.16	U
PM-4	11/15	UF	CS	<1.00	1.00	U
PM-5	02/15	UF	CS	<4.00		U
PM-5	11/15	UF	CS	<1.00	1.00	U
G-1A	03/07	UF	CS	<4.00		U
G-1A	11/15	UF	CS	<1.00	1.00	U
G-2A	03/07	UF	CS	<4.00		U
G-2A	11/15	UF	CS	<1.00	1.00	U
G-3A	03/06	UF	CS	<4.00		U
G-3A	08/03	UF	CS	<1.00	1.00	U
G-3A	08/03	UF	CS	<4.16	4.16	U
G-3A	11/15	UF	CS	<1.00	1.00	U
G-4A	03/06	UF	CS	<4.00		U
G-4A	11/15	UF	CS	<1.00	1.00	U

[a]Codes: UF–unfiltered; F–filtered; CS–customer sample; DUP–laboratory duplicate.
[b]MDL = method detection limit.
[c]Laboratory Qualifiers: U–not detected; J–result estimated because it is below the analytical laboratory's reporting limit.

Table 5-34. Mortandad Canyon Alluvial Groundwater Perchlorate in 2000 (µg/L)

Station Name	Date	Codes[a]	Symbol	Result	MDL[b]	Lab Qual Code[c]
MCO-2	07/17	UF	CS	<1.00	1.00	U
MCO-3	02/24	F	CS	66.00		
MCO-3	04/17	F	CS	33.00		
MCO-3	06/23	F	CS	66.00		
MCO-3	07/17	UF	CS	120.00	1.00	
MCO-3	08/15	F	CS	170.00	1.00	
MCO-3	10/30	UF	CS	280.00	1.00	
MCO-5	07/07	UF	CS	252.00		
MCO-6	02/24	F	CS	210.00		
MCO-6	04/17	F	CS	400.00		
MCO-6	06/23	F	CS	240.00		
MCO-6	07/10	UF	CS	268.00		
MCO-6	08/15	F	CS	180.00	1.00	
MCO-6	10/30	UF	CS	170.00	1.00	
MCO-7	02/24	F	CS	190.00		
MCO-7	02/24	UF	CS	190.00		
MCO-7	04/17	F	CS	180.00		
MCO-7	06/23	F	CS	220.00		
MCO-7	07/10	UF	CS	282.00		
MCO-7	08/15	F	CS	240.00	1.00	
MCO-7	10/30	UF	CS	69.00	1.00	
MCO-7.5	07/11	UF	CS	252.00		

[a]Codes: UF–Unfiltered; F–Filtered; CS–Customer Sample; DUP–Laboratory Duplicate.
[b]MDL = method detection limit.
[c]Laboratory Qualifiers: U–not detected; J–result estimated because it is below the analytical laboratory's reporting limit.

Table 5-35. Number of Samples Collected for Each Suite of Organic Compounds in Groundwater for 2000

		Organic Suite[a]			
Station Name	**Date**	**HE**	**PCB**	**Semivolatile**	**Volatile**
Ancho Spring	09/26	1			
Basalt Spring	07/25		1	1	1
CDBO-6	12/12			1	1
DI Blank	02/15	1			
DI Blank	06/21	1			
DI Blank	06/26	1	1	1	1
DI Blank	08/01		1	1	1
DI Blank	09/26	1	1	1	1
Doe Spring	09/27	1	1	1	1
G-1A	11/15	1			
G-2A	06/20	1			
G-3A	06/20	1			
G-4A	06/20	1			
LAO-0.7	08/01				1
LAO-2	06/26		1	1	1
LAO-3A	06/26		1	1	1
LAO-4	08/01		1	1	1
LAO-C	08/01		1	1	1
MCO-2	07/17		1	1	1
MCO-5	07/07		1	1	
MCO-6	07/10		2		
MCO-7	07/10		1		
MCO-7.5	07/11		1		
O-1	06/21	1			
O-4	06/21	1			
Organics Trip Blank	05/02				1
Organics Trip Blank	05/03				1
Organics Trip Blank	06/26				1
Organics Trip Blank	06/27				1
Organics Trip Blank	07/17				1
Organics Trip Blank	07/19				1
Organics Trip Blank	07/25				1
Organics Trip Blank	07/27				1
Organics Trip Blank	08/01				1
Organics Trip Blank	09/25				1
Organics Trip Blank	09/26				1
Organics Trip Blank	10/26				1
PM-1	06/20	1			
PM-2	02/14	1			
PM-2	06/20	1			
PM-2	11/15	1			
PM-3	06/21	1			
PM-4	06/21	1			
PM-4	11/15	1			
PM-5	02/14	1			
PM-5	06/20	1			

Table 5-35. Number of Samples Collected for Each Suite of Organic Compounds in Groundwater for 2000 (Cont.)

		Organic Suite[a]			
Station Name	**Date**	**HE**	**PCB**	**Semivolatile**	**Volatile**
PM-5	11/15	1			
POI-4	07/19	1	1	1	1
Spring 10	09/27	1	1	1	1
Spring 3	09/25		1	1	1
Spring 3A	09/25		1	1	1
Spring 4	09/25	1	2	1	2
Spring 4A	09/25	1			
Spring 5A	09/26	1	1	1	1
Spring 5B	07/26	1	1	1	1
Spring 6	09/26	1	1	1	1
Spring 6	09/26	1	1		1
Spring 8A	09/26	1	1	1	1
Spring 9A	09/27	1	1	1	1
Test Well 1	05/02	1	1	1	1
Test Well 2	05/03	1			
Test Well 3	05/03	1	1	1	1
Test Well 3	05/03	1	1	1	1
Test Well 4	05/02	1	1	1	1
Test Well 8	05/02	1			
Test Well DT-10	10/27	1	1	1	1
Test Well DT-5A	10/26	1	1	1	1
Test Well DT-5A	10/26	1	1	1	1

[a] High explosives, polychlorinated biphenyls, semivolatiles, and volatiles.

Table 5-36. Organic Compounds Detected in Groundwater Samples in 2000

Detect[a]	Station Name	Date	Code[b]	Suite[c]	Analyte	Result	MDL[d]	Units
Detect	Test Well 4	05/02	UF	PEST/PCB	Aroclor-1260	0.53		µg/L
Detect	Test Well 4	05/02	UF	SVOA	Benzoic Acid	9.00		µg/L
	Organics Trip Blank	05/02	UF	VOA	Chloroform	5.10		µg/L
	Organics Trip Blank	05/02	UF	VOA	Chloroethane	2.50		µg/L
	Organics Trip Blank	05/02	UF	VOA	Bromodichloromethane	1.10		µg/L
	Organics Trip Blank	05/03	UF	VOA	Chloroform	4.50		µg/L
	Organics Trip Blank	05/03	UF	VOA	Chloroethane	2.40		µg/L
	Organics Trip Blank	05/03	UF	VOA	Bromodichloromethane	1.10		µg/L
	Organics Trip Blank	07/19	UF	VOA	Chloromethane	0.84		µg/L
	Organics Trip Blank	07/27	UF	VOA	Chloroform	6.60	0.198	µg/L
	Organics Trip Blank	07/27	UF	VOA	Bromodichloromethane	1.70	0.024	µg/L
Detect	LAO-0.7	08/01	UF	VOA	Methyl-2-pentanone[4-]	6.90		µg/L
	Organics Trip Blank	08/01	UF	VOA	Acetone	14.00		µg/L
	LAO-0.7	08/01	UF	VOA	Acetone	23.00		µg/L
	LAO-C	08/01	UF	VOA	Acetone	20.00		µg/L
	DI Blank	08/01	UF	VOA	Acetone	15.00		µg/L
	LAO-4	08/01	UF	VOA	Chloromethane	1.80		µg/L
	Organics Trip Blank	08/01	UF	VOA	Chloroethane	4.20		µg/L
	LAO-0.7	08/01	UF	VOA	Methylene chloride	1.70		µg/L
	LAO-4	08/01	UF	VOA	Methylene chloride	1.30		µg/L
	DI Blank	08/01	UF	VOA	Methylene chloride	13.00		µg/L
	Organics Trip Blank	08/01	UF	VOA	Methylene chloride	2.60		µg/L
	LAO-C	08/01	UF	VOA	Methylene chloride	2.20		µg/L
Detect	LAO-0.7	08/01	UF	VOA	Butanone[2-]	13.00		µg/L
	Organics Trip Blank	09/25	UF	VOA	Chloroform	7.10	0.198	µg/L
	Organics Trip Blank	09/25	UF	VOA	Bromodichloromethane	1.80	0.024	µg/L
	DI Blank	09/26	UF	SVOA	Bis(2-ethylhexyl)phthalate	1.70	0.320	µg/L
	Organics Trip Blank	09/26	UF	VOA	Chloroform	6.60	0.198	µg/L
	Organics Trip Blank	09/26	UF	VOA	Bromodichloromethane	1.60	0.024	µg/L
	Spring 9A	09/27	F	SVOA	Bis(2-ethylhexyl)phthalate	1.30	0.320	µg/L

Table 5-36. Organic Compounds Detected in Groundwater Samples in 2000 (Cont.)

Detect[a]	Station Name	Date	Code[b]	Suite[c]	Analyte	Result	MDL[d]	Units
Detect	Spring 10	09/27	F	VOA	Toluene	1.50	0.262	µg/L
	Organics Trip Blank	10/26	UF	VOA	Toluene	1.00	0.262	µg/L
	Organics Trip Blank	10/26	UF	VOA	Chloroform	7.20	0.198	µg/L
	Organics Trip Blank	10/26	UF	VOA	Bromodichloromethane	1.80	0.024	µg/L

[a] Indicates compound was not detected in associated blank. Results are sorted by analyte and date to show association of field blanks with samples.
[b] UF–unfiltered; F–filtered.
[c] PEST/PCB–pesticides and polychlorinated biphenyls; SVOA–semivolatile organics; VOA–volatile organics.
[d] MDL = method detection limit.

Table 5-37. Quality Assurance Sample Results for Radiochemical Analysis of Water Samples by Paragon in 2000[a,b] (pCi/L)

	Date	Code	^{90}Sr		
DI Blank	02/15	CS	0.000	0.018	
DI Blank	06/21	CS	0.083	0.021	0.140
DI Blank	06/26	CS	0.048	0.021	0.140
DI Blank	07/26	CS	0.039	0.018	0.120
DI Blank	08/01	CS	0.070	0.023	
Average of Blank Values			0.048	0.020	
Standard Deviation of Blank Values			0.032		
Spiked Sample	04/26	CS	4.020	0.185	
Spiked Sample	05/03	CS	4.290	0.198	0.093
Spiked Sample	03/03	CS	3.980	0.185	0.130
Average of Results			4.097	0.189	
Standard Deviation of Results			0.169		
Spiked Concentration			4.000		
Average Result/Spiked Value			1.024		

[a] Three colums are listed: the first is the value; the second is the radioactive counting uncertainties (1 std. dev.); the third is the minimum detectable activity. Radioactivity counting uncertainties may be less than analytical method uncertainties.
[b] See Appendix B for an explanation of negative numbers.

Table 5-38. Quality Assurance Sample Results for Radiochemical Analysis by GEL of Water Samples in 2000[a,b] (pCi/L)

	Date	F/UF	Code	^{3}H			^{90}Sr			^{137}Cs			^{234}U			$^{235,236}U$			^{238}U		
DI Blank	08/03	UF	CS				–0.015	0.369	0.651												
DI Blank	09/26	UF	CS	–63	71.4	242	–0.089	0.099	0.353	0.301	0.672	2.360	–0.0145	0.0160	0.0724	–0.0048	0.0108	0.0520	0.0048	0.0084	0.0355
DI Blank	09/26	UF	DUP	–180	58	201															
DI Blank	09/27	UF	CS				0.036	0.105	0.368												
DI Blank	11/15	UF	CS				–0.047	0.060	0.209												
DI Blank	12/19	UF	CS				–0.019	0.117	0.411												
Average of Blank Values				–121			–0.027														
Standard Deviation of Blank Values				83			0.046														
Spiked Sample	09/26	UF	CS	[c]	48.9	168	[c]	0.133	0.456	0.269	0.615	2.250	0.0131	0.0146	0.0526	0.0176	0.0108	0.0323	0.0175	0.0139	0.0472
Spiked Sample	10/27	UF	CS	9,950	207	201	4.500	0.286	0.509	<0.433	0.843	2.990	–0.0031	0.0080	0.0651	0.0121	0.0114	0.0563	–0.0001	0.0074	0.0562
Spiked Sample	10/27	UF	DUP										0.0218	0.0170	0.0821	–0.0096	0.0122	0.0943	–0.0001	0.0077	0.0582
Spiked Sample	12/06	UF	CS	9,700	203	198	5.590	0.388	0.537	<–0.143	0.639	2.240	0.0264	0.0209	0.1030	–0.0124	0.0072	0.0924	0.0003	0.0103	0.0795
Spiked Sample	12/06	UF	DUP	9,710	202	197															
Spiked Sample	12/13	UF	CS				5.370	0.211	0.256												
Average of Spiked Value				9,787			5.153														
Standard Deviation of Spiked Values				142			0.576														
Spiked Concentration				10,000			5														
Ratio of Result/Spiked Value				0.98			1.03														

Table 5-38. Quality Assurance Sample Results for Radiochemical Analysis by GEL of Water Samples in 2000[a,b] (pCi/L) (Cont.)

	Date	F/UF	Code	^{238}Pu			$^{239,240}Pu$			^{241}Am			Gross Alpha			Gross Beta		
DI Blank	08/03	UF	CS															
DI Blank	09/26	UF	CS	–0.0043	0.0044	0.0318	0.0000	1.0100	0.0117	0.0270	0.0109	0.0279	0.081	0.282	1.180	–0.452	0.682	2.490
DI Blank	09/26	UF	DUP															
DI Blank	09/27	UF	CS															
DI Blank	11/15	UF	CS															
DI Blank	12/19	UF	CS															
Average of Blank Values																		
Standard Deviation of Blank Values																		
Spiked Sample	09/26	UF	CS	0.1060	0.0407	0.0360	0.1200	0.0474	0.0978	0.1150	0.0217	0.0257	0.693	0.456	1.400	10.600	1.050	2.360
Spiked Sample	10/27	UF	CS	0.0880	0.0287	0.0697	0.1160	0.0319	0.0666	0.1170	0.0224	0.0269	0.314	0.211	0.641	8.530	0.633	1.360
Spiked Sample	10/27	UF	DUP	0.1880	0.0368	0.0247	0.1040	0.0247	0.0312									
Spiked Sample	12/06	UF	CS	0.1640	0.0268	0.0275	0.0932	0.0207	0.0346	0.1320	0.0315	0.0498	0.016	0.254	0.747	9.860	0.774	1.750
Spiked Sample	12/06	UF	DUP															
Spiked Sample	12/13	UF	CS															
Average of Spiked Value				0.1365			0.1083			0.1213								
Standard Deviation of Spiked Values				0.0472			0.0121											
Spiked Concentration				0.1000			0.1000			0.1000								
Ratio of Result/Spiked Value				1.37			1.08			1.21								

[a] Three colums are listed: the first is the value; the second is the radioactive counting uncertainties (1 std. dev.); the third is the minimum detectable activity. Radioactivity counting uncertainties may be less than analytical method uncertainties.
[b] See Appendix B for an explanation of negative numbers.
[c] Explanation in text.

Table 5-39. Quality Assurance Sample Results for Radiochemical Analysis of Water Samples by CST in 2000[a,b] (pCi/L[c])

	Date	Code[c]	^{3}H		^{137}Cs		^{234}U		$^{235,236}U$		^{238}U		^{238}Pu		$^{239,240}Pu$		^{241}Am		Gross Alpha		Gross Beta		Gross Gamma	
DI Blank	02/15	CS					0.002	0.014	0.011	0.012	–0.002	0.009												
DI Blank	06/26	CS	–70	430	–0.91	10.28	0.022	0.026	0.002	0.015	0.035	0.021	0.009	0.008	0.005	0.005	–0.011	0.020	0.8	1.2	1.4	1.1	38.3	48.8
DI Blank	07/26	CS	600	440	–1.08	8.58	0.009	0.009	–0.007	0.005	0.021	0.010	–0.003	0.003	0.017	0.008	0.010	0.008	–0.2	0.2	0.1	0.2	435.5	53.8
DI Blank	08/01	CS	420	430	–0.53	1.75	0.008	0.015	0.008	0.008	0.018	0.010	0.025	0.009	0.005	0.006	0.020	0.008	0.0	0.0	–0.4	0.7	335.4	53.2
Analytical Detection Limit			700		4.00								0.040		0.040		0.040		3.0		3.0		120.0	
Average of Blank Values			317	433	–0.84	6.87	0.013	0.017	0.001	0.009	0.025	0.014	0.010	0.007	0.009	0.006	0.006	0.012	0.2	0.5	0.4	0.7	269.7	51.9
Standard Deviation of Blank Values			347		0.28		0.008		0.008		0.009		0.014		0.007		0.016		0.5		0.9		206.6	
Spiked Sample	04/05	CS			–0.61	5.51							0.101	0.018	0.113	0.018	0.095	0.020	1.1	1.3	10.5	3.6	56.4	50.3
Spiked Sample	05/03	CS	8,290	990	–0.69	2.10	–0.001	0.014	–0.009	0.005	0.004	0.007	0.144	0.027	0.190	0.030	0.056	0.018	0.0	0.0	7.8	2.9	52.0	48.9
Spiked Sample	07/18	CS			–0.65	4.50	–0.014	0.014	0.006	0.010	0.001	0.009	0.117	0.020	0.116	0.020	0.096	0.019	0.3	0.6	9.7	3.7	45.1	51.2
Spiked Sample	08/16	CS	8,770	1,000	–0.43	1.87	–0.018	0.039	–0.006	0.013	0.000	0.008	0.081	0.018	0.108	0.022	0.118	0.024	0.6	1.2	9.3	3.4	196.5	49.9
Average of Spiked Value			8,530	995									0.111	0.021	0.132	0.023	0.091	0.020						
Standard Deviation of Spiked Values			339										0.026		0.039		0.026							
Spiked Concentration			10,000										0.100		0.100		0.100							
Ratio of Result/Spiked Value			0.85										1.11		1.32		0.91							

[a] Two colums are listed: the first is the value; the second is the radioactive counting uncertainties (1 std. dev.). Radioactivity counting uncertainties may be less than analytical method uncertainties.
[b] See Appendix B for an explanation of negative numbers.
[c] CS: Customer Sample.

Table 5-40. Quality Assurance Sample Results for Metals Analysis by GEL of Water Samples in 2000 (µg/L)

Station Name	Date	F/UF	Code		Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe	Hg
DI Blank	09/26	UF	CS	GELC	<1	24	<3	8.0	<1	<0.5	<0.6	1.5	1	<2	<20	<0.1
Spiked Sample	09/26	UF	CS	GELC	26	21	<3	<5	507	<0.5	<0.6	<0.6	<1	<2	<20	[a]
Spiked Sample	10/27	UF	CS	GELC	24	<23	<3	3	490	<0.5	<0.6	<0.6	<1	<2	6	4.3
Spiked Sample	12/06	UF	CS	GELC	24	<23	<3	<5	486	<0.5	<0.6	<0.6	<1	<2	15	5.5
Average of Spiked Value					25				494							4.9
Standard Deviation of Spiked Values					1.1				11.2							0.9
Spiked Concentration					25				500							5.0
Ratio of Result/Spiked Value					0.99				0.99							0.98

Table 5-40. Quality Assurance Sample Results for Metals Analysis by GEL of Water Samples in 2000 (µg/L) (Cont.)

Station Name	Date	F/UF	Code		Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Ti	V	Zn
DI Blank	09/26	UF	CS	GELC	<1.2	<1	<3	<2	<0.7	<2	<2	<0.5	0.43	<1	<4
Spiked Sample	09/26	UF	CS	GELC	<1.2	<1	<3	9	<0.7		<2	<0.5	0.11	<1	<4
Spiked Sample	10/27	UF	CS	GELC	0.8	<1	<3	8	<0.1	<2	<2	<0.5	0.02	<1	<1
Spiked Sample	12/06	UF	CS	GELC	<1.2	<1	<3	7	0.2	<2	<2	<0.5	0.02	<1	<1
Average of Spiked Value								8							
Standard Deviation of Spiked Values								1.0							
Spiked Concentration								8							
Ratio of Result/Spiked Value								1.07							

[a] See explaination in text.

Table 5-41. Quality Assurance Sample Results for Metals Analysis by CST of Water Samples in 2000 (µg/L)

	Date	F/UF	Code		Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe	Hg
DI Blank	06/26	UF	CS	CST	<6	170	<2	<75	28	2	<3	8	10	5	<50	
DI Blank	06/26	UF	CS	CST	<6	<580	<2	<75	2	2	<3	<6	<5	<4	<50	
DI Blank	07/26	UF	CS	CST	9	<270	<2	10	<2	<1	<3	<6	<5	<4	<30	
DI Blank	07/26	UF	CS	CST												<0.1
DI Blank	08/01	UF	CS	CST	<6	51	<3	<18	<2	<1	<3	<6	<5	37	42	<0.1
Spiked Sample	04/05	UF	CS	CST	<22	<100	<2	<39	513	<2	<3	<6	<5	<25	<30	2.3
Spiked Sample	05/03	UF	CS	CST	26	<40	<3	<9	506	<1	<3	<6	<5	<4	<40	1.8*
Spiked Sample	07/18	UF	CS	CST	32	<40	<2	<9	464	<1	<3	<6	<5	<4	<30	4.5
Spiked Sample	08/16	UF	CS	CST	17	<40	<2	<9	461	<1	<3	<6	<5	4	<30	4.8
Spiked Sample	08/16	UF	CS	CST												
Average of Spiked Value					25				486							3.0
Standard Deviation of Spiked Values					8				27							2.0
Spiked Concentration					25				500							5.0
Ratio of Result/Spiked Value					1.00				0.97							0.67*

Table 5-41. Quality Assurance Sample Results for Metals Analysis by CST of Water Samples in 2000 (µg/L) (Cont.)

	Date	F/UF	Code		Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Ti	V	Zn
DI Blank	06/26	UF	CS	CST	<1	40	<20	<5	<3		60	53		14	14
DI Blank	06/26	UF	CS	CST	<1	<43	<20	<2	<3	3	<60	<2		<12	42
DI Blank	07/26	UF	CS	CST	3	<10	<20	<2	<3		<60	<1		<7	<10
DI Blank	07/26	UF	CS	CST						<4					
DI Blank	08/01	UF	CS	CST	<2	<10	<20	<5	<3	<3	<60	<1		<7	<10
Spiked Sample	04/05	UF	CS	CST	<3	<10	<20	7	<3	<3	<60	<2		<7	<10
Spiked Sample	05/03	UF	CS	CST	<4	<10	<20	8	<3	<3	<60	<1		<7	<10
Spiked Sample	07/18	UF	CS	CST	<5	<10	<20	<2	<3	<3	<60	<1		<7	<10
Spiked Sample	08/16	UF	CS	CST	<1	<10	<20	7	<3		<60	<1		<7	<10
Spiked Sample	08/16	UF	CS	CST						3					
Average of Spiked Value								7							
Standard Deviation of Spiked Values								1							
Spiked Concentration								8							
Ratio of Result/Spiked Value								0.98							

*Explanation in text.

Table 5-42. QAP 51 September 1999, Paragon Analytics, Inc.

Radionuclide	Reported Value	Reported Error	EML[a] Value	EML[a] Error	Reported/ EML[a]	Evaluation[b]
Soil						
^{228}Ac	159	27	124	4.8	1.28	A
^{241}Am	2.46	0.72	1.44	0.19	1.71	A
^{212}Bi	158	31	140	14	1.13	
^{214}Bi	87	15	69.5	1.8	1.25	A
Bq U	424	35	401	8.7	1.06	A
^{137}Cs	271	45	204	5	1.33	A
^{40}K	1,000	170	780	27	1.28	A
^{212}Pb	173	29	127	4.8	1.36	A
^{214}Pb	99	17	72	0.42	1.38	A
^{239}Pu	3.5	0.76	3.2	0.5	1.09	A
^{90}Sr	13.5	3.9	13	0.47	1.04	A
^{234}Th	318	79	198	5.6	1.61	A
^{234}U	207	25	190	5.2	1.09	A
^{238}U	209	25	202	7.2	1.04	A
Water						
^{241}Am	0.98	0.13	0.85	0.1	1.15	A
Bq U	0.86	0.11	0.76	0.04	1.13	A
^{60}Co	50.8	8.4	52.4	2.2	0.97	A
^{137}Cs	80	14	76	3.4	1.05	A
^{55}Fe	39.1	8.3	53	2	0.74	
^{3}H	78	11	80.7	3.7	0.97	A
^{63}Ni	113	16.1	114	10	0.99	A
^{238}Pu	0.83	0.12	0.79	0.08	1.05	A
^{239}Pu	0.93	0.13	0.87	0.1	1.07	A
^{90}Sr	1.71	0.31	1.72	0.1	0.99	W
^{234}U	0.469	0.083	0.37	0.02	1.27	A
^{238}U	0.377	0.071	0.36	0.02	1.05	A

[a] Environmental Measurements Laboratory.
[b] A = Acceptable
W = Acceptable with Warning
N = Not Acceptable

pCi/g or mL = Bq × 0.027

Table 5-43. QAP 52 June 2000, Paragon Analytics, Inc.

Radionuclide	Reported Value	Reported Error	EML[a] Value	EML[a] Error	Reported/ EML[a]	Evaluation[b]
Soil						
^{228}Ac	113.000	23.000	97.600	4.200	1.158	A
^{241}Am	3.810	0.800	3.360	0.510	1.134	A
^{212}Bi	92.000	55.000	106.000	7.000	0.868	A
^{214}Bi	91.000	19.000	86.700	3.800	1.050	A
Bq U	246.000	22.000	229.000	23.000	1.074	A
^{137}Cs	408.000	68.000	339.000	9.300	1.204	A
^{40}K	887.000	158.000	811.000	29.000	1.094	A
^{212}Pb	117.000	20.000	97.300	4.600	1.202	A
^{214}Pb	106.000	21.000	86.500	6.800	1.225	A
^{238}Pu	18.700	2.800	18.600	0.500	1.005	A
^{239}Pu	7.200	1.300	7.000	0.340	1.029	A
^{90}Sr	22.600	4.700	20.200	0.200	1.119	A
^{234}U	116.000	15.000	111.000	11.000	1.045	A
^{238}U	121.000	16.000	114.000	12.000	1.061	A
μg/g U	9.900	1.300	9.150	0.910	1.082	A
Water						
^{241}Am	1.930	0.260	1.950	0.180	0.990	A
Bq U	1.110	0.130	0.995	0.087	1.116	A
^{60}Co	49.200	8.300	48.900	1.800	1.006	A
^{137}Cs	105.000	17.000	103.000	4.000	1.019	A
^{3}H	91.000	14.000	79.400	2.500	1.146	A
^{63}Ni	153.000	38.000	112.000	11.000	1.366	A
^{238}Pu	0.950	0.140	0.944	0.040	1.006	A
^{239}Pu	0.880	0.130	0.918	0.030	0.959	A
^{90}Sr	2.900	0.520	3.390	0.120	0.855	W
^{234}U	0.560	0.093	0.482	0.040	1.162	A
^{238}U	0.519	0.088	0.492	0.040	1.055	A
μg/L U	0.040	0.005	0.040	0.003	1.010	

[a] Environmental Measurements Laboratory.
[b] A = Acceptable
W = Acceptable with Warning
N = Not Acceptable

pCi/g or mL = Bq × 0.027

Table 5-44. QAP 53 December 2000, Paragon Analytics, Inc.

Radionuclide	Reported Value	Reported Error	EML[a] Value	EML[a] Error	Reported/ EML[a]	Evaluation[b]
Soil						
^{228}Ac	88.000	14.700	80.200	3.600	1.097	A
^{241}Am	11.000	21.000	8.270	0.700	1.330	A
^{212}Bi	67.600	29.200	80.500	6.600	0.840	A
^{214}Bi	71.100	18.200	83.300	4.200	0.854	W
Bq U	309.000	27.000	327.000	11.000	0.945	A
^{137}Cs	1,163.000	147.000	1,020.000	51.000	1.140	A
^{40}K	808.000	113.000	713.000	38.000	1.133	A
^{212}Pb	87.400	14.300	79.300	4.300	1.102	A
^{214}Pb	84.700	13.700	86.300	4.300	0.981	A
^{238}Pu	19.200	2.800	19.100	0.200	1.005	A
^{239}Pu	18.200	2.900	16.800	0.300	1.083	A
^{90}Sr	50.900	9.700	50.400	2.000	1.010	A
^{234}Th	211.000	84.000	148.000	10.000	1.426	A
µg/g U	10.800	1.500	13.200	0.500	0.818	A
^{234}U	148.000	19.000	157.000	10.000	0.943	A
^{238}U	152.000	19.000	163.000	10.000	0.933	A
Water						
^{241}Am	1.250	0.170	1.190	0.045	1.050	A
Bq U	0.920	0.100	0.916	0.031	1.004	A
^{60}Co	72.000	9.000	73.700	2.900	0.977	A
^{137}Cs	65.600	9.100	67.000	3.500	0.979	A
^{3}H	99.000	17.000	91.300	0.300	1.084	A
^{238}Pu	0.740	0.100	0.786	0.011	0.941	A
^{239}Pu	0.590	0.080	0.591	0.021	0.998	A
^{90}Sr	4.610	0.850	4.530	0.120	1.018	A
µg/L U	0.020	0.004	0.030	0.001	0.658	N
^{234}U	0.480	0.070	0.481	0.023	0.998	A
^{238}U	0.350	0.060	0.368	0.012	0.951	A

[a] Environmental Measurements Laboratory.
[b] A = Acceptable
W = Acceptable with Warning
N = Not Acceptable

pCi/g or mL = Bq × 0.027

Table 5-45. QAP 51 September 1999, General Engineering Labs

Radionuclide	Reported Value	Reported Error	EML[a] Value	EML[a] Error	Reported/ EML[a]	Evaluation[b]
Soil						
^{228}Ac	131	20.4	124	4.8	1.06	A
^{241}Am	1.69	0.311	1.44	0.19	1.17	A
^{212}Bi	82.9	14.2	140	14	0.59	A
^{214}Bi	88.5	11.3	69.5	1.8	1.27	W
^{137}Cs	217	24.2	204	5	1.06	A
^{40}K	914	97.3	780	27	1.17	A
^{212}Pb	142	16.1	127	4.8	1.12	A
^{214}Pb	102	12.6	72	0.42	1.42	W
^{239}Pu	2.75	0.419	3.2	0.5	0.86	W
^{90}Sr	9.8	1.07	13	0.47	0.75	W
^{234}Th	188	45	198	5.6	0.95	A
^{234}U	183	23.5	190	5.2	0.96	A
^{238}U	197	25.1	202	7.2	0.98	A
μg/g U	15.1	0.16	16.3	0.3	0.93	A
Water						
^{241}Am	0.984	0.139	0.85	0.1	1.16	A
^{60}Co	54.8	5.91	52.4	2.2	1.05	A
^{137}Cs	77.6	8.24	76	3.4	1.02	A
^{55}Fe	45.8	10.6	53	2	0.86	A
Gross Alpha	1,790	43.9	1,580	20	1.13	A
Gross Beta	969	24.7	740	40	1.31	A
^{3}H	84.2	9.3	80.7	3.7	1.04	A
^{63}Ni	115	2.65	114	10	1.01	A
^{238}Pu	0.857	0.144	0.79	0.08	1.09	A
^{239}Pu	0.934	0.155	0.87	0.1	1.07	A
^{90}Sr	1.77	0.066	1.72	0.1	1.03	A
^{234}U	0.386	0.063	0.37	0.02	1.04	A
^{238}U	0.39	0.063	0.36	0.02	1.08	A
μg/L U	0.032	0.001	0.03	0.01	1.07	A

[a] Environmental Measurements Laboratory.
[b] A = Acceptable
W = Acceptable with Warning
N = Not Acceptable

pCi/g or mL = Bq × 0.027

Table 5-46. QAP 52 June 2000, General Engineering Laboratories

Radionuclide	Reported Value	Reported Error	EML[a] Value	EML[a] Error	Reported/ EML[a]	Evaluation[b]
Soil						
^{228}Ac	108.000	16.600	97.600	4.200	1.107	A
^{241}Am	3.530	0.507	3.360	0.510	1.051	A
^{212}Bi	63.300	17.900	106.000	7.000	0.597	A
^{214}Bi	94.800	14.000	86.700	3.800	1.093	A
^{137}Cs	349.000	38.200	339.000	9.300	1.029	A
^{40}K	850.000	94.500	811.000	29.000	1.048	A
^{212}Pb	110.000	12.900	97.300	4.600	1.131	A
^{214}Pb	106.000	12.800	86.500	6.800	1.225	A
^{239}Pu	5.000	1.470	7.000	0.340	0.714	W
^{90}Sr	14.300	1.320	20.200	0.200	0.708	W
^{234}Th	114.000	33.300	130.000	5.000	0.877	A
^{234}U	110.000	13.100	111.000	11.000	0.991	A
^{238}U	113.000	13.400	114.000	12.000	0.991	A
µg/g U	8.160	0.200	9.150	0.910	0.892	
Water						
^{241}Am	2.530	0.305	1.950	0.180	1.297	W
^{60}Co	51.400	5.320	48.900	1.800	1.051	A
^{137}Cs	104.000	10.900	103.000	4.000	1.010	A
^{55}Fe	31.600	1.730	33.100	0.700	0.955	A
Gross Alpha	1,752.000	42.700	1,700.000	170.000	1.031	A
Gross Beta	932.000	24.500	690.000	70.000	1.351	W
^{3}H	81.100	6.080	79.400	2.500	1.021	A
^{63}Ni	134.000	4.640	112.000	11.000	1.196	A
^{238}Pu	1.340	0.239	0.944	0.040	1.419	N
^{239}Pu	1.260	0.225	0.918	0.030	1.373	W
^{90}Sr	3.130	0.260	3.390	0.120	0.923	A
^{234}U	0.470	0.057	0.482	0.040	0.975	A
^{238}U	0.490	0.059	0.492	0.040	0.996	A
µg/L U	0.044	0.001	0.040	0.003	1.103	

[a] Environmental Measurements Laboratory.
[b] A = Acceptable
W = Acceptable with Warning
N = Not Acceptable

pCi/g or mL = Bq × 0.027

Table 5-47. QAP 53 December 2000, General Engineering Labs

Radionuclide	Reported Value	Reported Error	EML[a] Value	EML[a] Error	Reported/ EML[a]	Evaluation[b]
Soil						
^{228}Ac	80.300	13.700	80.200	3.600	1.001	A
^{241}Am	9.550	4.330	8.270	0.700	1.155	A
^{212}Bi	52.900	13.800	80.500	6.600	0.657	A
^{214}Bi	74.200	11.400	83.300	4.200	0.891	A
^{137}Cs	1,120.000	153.000	1,020.000	51.000	1.098	A
^{40}K	858.000	86.200	713.000	38.000	1.203	A
^{212}Pb	88.100	10.200	79.300	4.300	1.111	A
^{214}Pb	87.900	11.500	86.300	4.300	1.019	A
^{239}Pu	17.400	2.070	16.800	0.300	1.036	A
^{90}Sr	41.100	1.910	50.400	2.000	0.815	A
^{234}Th	113.000	41.500	148.000	10.000	0.764	W
µg/g U	8.930	0.330	13.200	0.500	0.677	A
^{234}U	132.000	13.600	157.000	10.000	0.841	W
^{238}U	134.000	13.700	163.000	10.000	0.822	W
Water						
^{241}Am	1.330	0.130	1.190	0.045	1.118	A
^{60}Co	76.200	5.380	73.700	2.900	1.034	A
^{137}Cs	68.100	5.000	67.000	3.500	1.016	A
Gross Alpha	964.000	33.900	1,070.000	100.000	0.901	A
Gross Beta	1,020.000	25.200	950.000	90.000	1.074	A
^{3}H	105.000	9.210	91.300	0.300	1.150	A
^{238}Pu	0.760	0.090	0.786	0.011	0.967	A
^{239}Pu	0.590	0.070	0.591	0.021	0.998	A
^{90}Sr	3.600	0.190	4.530	0.120	0.795	W
µg/L U	0.020	0.001	0.030	0.001	0.658	N
^{234}U	0.390	0.040	0.481	0.023	0.811	W
^{238}U	0.320	0.040	0.368	0.012	0.870	W

[a] Environmental Measurements Laboratory.
[b] A = Acceptable
W = Acceptable with Warning
N = Not Acceptable

pCi/g or mL = Bq $\times$ 0.027

Table 5-48. QAP 51 September 1999, Chemical Sciences and Technology Division, Los Alamos National Laboratory

Radionuclide	Reported Value	Reported Error	EML[a] Value	EML[a] Error	Reported/ EML[a]	Evaluation[b]
Soil						
^{228}Ac	151	17	124	4.8	1.22	A
^{228}Ac	174	19	124	4.8	1.40	W
^{228}Ac	144	16	124	4.8	1.16	A
^{241}Am	3.13	0.37	1.44	0.19	2.17	W
^{241}Am	1.88	0.37	1.44	0.19	1.31	A
^{241}Am	2.26	0.37	1.44	0.19	1.57	W
^{212}Bi	119	15	140	14	0.85	A
^{212}Bi	107	14	140	14	0.76	A
^{212}Bi	107	13	140	14	0.76	A
^{214}Bi	99	11	69.5	1.8	1.42	N
^{214}Bi	117	13	69.5	1.8	1.68	N
^{214}Bi	92	10	69.5	1.8	1.32	W
^{137}Cs	268	28	204	5	1.31	W
^{137}Cs	262	28	204	5	1.28	W
^{137}Cs	236	25	204	5	1.16	A
^{212}Pb	138	15	127	4.8	1.09	A
^{212}Pb	156	17	127	4.8	1.23	W
^{212}Pb	147	16	127	4.8	1.16	A
^{214}Pb	85	9	72	0.42	1.18	A
^{214}Pb	93	10	72	0.42	1.29	W
^{214}Pb	87	10	72	0.42	1.21	A
^{239}Pu	13.41	0.61	3.2	0.5	4.19	N
^{239}Pu	9.59	0.49	3.2	0.5	3.00	N
^{234}Th	338	39	198	5.6	1.71	W
^{234}Th	562	70	198	5.6	2.84	N
^{234}Th	423	48	198	5.6	2.14	N
µg/g U	16.01	1.6	16.3	0.3	0.98	A
µg/g U	16.46	1.65	16.3	0.3	1.01	A
µg/g U	15.72	1.57	16.3	0.3	0.96	A
Water						
^{241}Am	0.856	0.024	0.85	0.1	1.01	A
^{241}Am	0.845	0.024	0.85	0.1	0.99	A
^{241}Am	0.903	0.026	0.85	0.1	1.06	A
^{60}Co	59.1	6.3	52.4	2.2	1.13	A
^{60}Co	57.6	6.2	52.4	2.2	1.10	A
^{60}Co	58	6.2	52.4	2.2	1.11	A
^{137}Cs	87.6	9.3	76	3.4	1.15	A
^{137}Cs	85.9	9.1	76	3.4	1.13	A
^{137}Cs	90.7	9.6	76	3.4	1.19	W
Gross Alpha	1,713	353	1,580	20	1.08	A
Gross Alpha	1,676	346	1,580	20	1.06	A
Gross Alpha	1,772	364	1,580	20	1.12	A
Gross Beta	1,021	223	740	40	1.38	W
Gross Beta	1,006	221	740	40	1.36	W
Gross Beta	1043	227	740	40	1.41	W

Table 5-48. QAP 51 September 1999, Chemical Sciences and Technology Division, Los Alamos National Laboratory (Cont.)

Radionuclide	Reported Value	Reported Error	EML[a] Value	EML[a] Error	Reported/ EML[a]	Evaluation[b]
Water (Cont.)						
^{3}H	80	27.4	80.7	3.7	0.99	A
^{3}H	76.6	27.4	80.7	3.7	0.95	A
^{3}H	68.1	26.6	80.7	3.7	0.84	A
^{238}Pu	0.788	0.022	0.79	0.08	1.00	A
^{238}Pu	0.766	0.019	0.79	0.08	0.97	A
^{238}Pu	0.794	0.02	0.79	0.08	1.01	A
^{239}Pu	0.866	0.024	0.87	0.1	1.00	A
^{239}Pu	0.83	0.02	0.87	0.1	0.95	A
^{239}Pu	0.845	0.021	0.87	0.1	0.97	A
^{90}Sr	1.78	0.21	1.72	0.1	1.04	A
^{90}Sr	1.65	0.18	1.72	0.1	0.96	A
^{90}Sr	1.95	0.22	1.72	0.1	1.13	A

[a] Environmental Measurements Laboratory.
[b] A = Acceptable
W = Acceptable with Warning
N = Not Acceptable

pCi/g or mL = Bq × 0.027

Table 5-49. MAPEP 99 W7 June 2000, Paragon Analytics, Inc.

Analyte	Reported Value	Reported Error	MAPEP Value	Reported/ MAPEP	Units	Evaluation[a]
As	0.21		0.203	1.03	(mg/L)	A
Ba	51.1		50.8	1.01	(mg/L)	A
Be	0.507		0.508	1.00	(mg/L)	A
Cd	0.3		0.305	0.98	(mg/L)	A
Se	0.194		0.203	0.96	(mg/L)	A
Ag	1.22				(mg/L)	
Tl	0.511		0.508	1.01	(mg/L)	A
U-Total	NR		0.036			
^{238}U	NR		0.036			
V	0.72		0.711	1.01	(mg/L)	A
Zn	4.92		5.08	0.97	(mg/L)	A
^{241}Am	0.655	0.04	0.635	1.03	(Bq/L)	A
^{134}Cs	72.8	6.65	82.9	0.88	(Bq/L)	A
^{137}Cs	68.6	5.72	72.7	0.94	(Bq/L)	A
^{57}Co	93.2	7.71	96.8	0.96	(Bq/L)	A
^{60}Co	267	22	270	0.99	(Bq/L)	A
^{55}Fe	NR		97			
^{54}Mn	392	32.4	395	0.99	(Bq/L)	A
^{63}Ni	174	21.8	157	1.11	(Bq/L)	A
^{238}Pu	0.33	0.02	0.32	1.03	(Bq/L)	A
$^{239,240}Pu$	0.01	0			(Bq/L)	
^{90}Sr	7.23	0.65	8.19	0.88	(Bq/L)	A
$^{234,233}U$	0.449	0.03	0.428	1.05	(Bq/L)	A
^{235}U	0.0304	0			(Bq/L)	
^{238}U	0.449	0.03	0.444	1.01	(Bq/L)	A
^{65}Zn	231	19.4	220	1.05	(Bq/L)	A

[a] Flags:
A = Result acceptable Bias ≤20%
W = Result acceptable with warning 20% < Bias ≤30%
N = Result not acceptable Bias > 30%
L = Uncertainty potentially too low (for infomation purposes only)
H = Uncertainty potentially too high (for information purposes only)
QL = Detection Limit
RW = Report Warning
NR = Not Reported

Table 5-50. MAPEP 99 W7 June 2000, General Engineering Laboratories Inc.

Analyte	Reported Value	Reported Error	MAPEP Value	Reported/ MAPEP	Units	Evaluation[a]
As	0.208	0.04	0.203	1.02	(mg/L)	A
Ba	50.5	10.1	50.8	0.99	(mg/L)	A
Be	0.52	0.1	0.508	1.02	(mg/L)	A
Cd	0.314	0.06	0.305	1.03	(mg/L)	A
Se	0.202	0.04	0.203	1.00	(mg/L)	A
Ag	1.08	0.21			(mg/L)	
Tl	0.538	0.1	0.508	1.06	(mg/L)	A
U-Total	NR		0.036			
^{238}U	NR		0.036			
V	0.753	0.15	0.711	1.06	(mg/L)	A
Zn	5.17	1.03	5.08	1.02	(mg/L)	A
^{241}Am	0.725	0.13	0.635	1.14	(Bq/L)	A
^{134}Cs	NR		82.9			
^{137}Cs	67	7.84	72.7	0.92	(Bq/L)	A
^{57}Co	89.9	11.1	96.8	0.93	(Bq/L)	A
^{60}Co	271	31.1	270	1.00	(Bq/L)	A
^{55}Fe	73.5	8.84	97	0.76	(Bq/L)	W
^{54}Mn	388	49.9	395	0.98	(Bq/L)	A
^{63}Ni	131	8.4	157	0.83	(Bq/L)	A
^{238}Pu	0.36	0.06	0.32	1.13	(Bq/L)	A
$^{239,240}Pu$	0.00345	0			(Bq/L)	
^{90}Sr	5.84	0.37	8.19	0.71	(Bq/L)	W
$^{234,233}U$	0.477	0.06	0.428	1.11	(Bq/L)	A
^{238}U	0.481	0.06	0.444	1.08	(Bq/L)	A
^{65}Zn	234	27.6	220	1.06	(Bq/L)	A

[a] Flags:
A = Result acceptable Bias ≤2%
W = Result acceptable with warning 20% < Bias ≤30%
N = Result not acceptable Bias > 30%
L = Uncertainty potentially too low (for infomation purposes only)
H = Uncertainty potentially too high (for information purposes only)
QL = Detection Limit
RW = Report Warning
NR = Not Reported

Table 5-51. MAPEP 99 W7 June 2000, Chemical Sciences and Technology Division, Los Alamos National Laboratory

Analyte	Reported Value	Reported Error	MAPEP Value	Reported/ MAPEP	Units	Evaluation[a]
Sb	0.0003	0			(mg/L)	
As	0.238	0.02	0.203	1.17	(mg/L)	A
Ba	45	4.5	50.8	0.89	(mg/L)	A
Be	0.46	0.04	0.508	0.91	(mg/L)	A
Cd	0.26	0.02	0.305	0.85	(mg/L)	A
Cr	0.002	0			(mg/L)	A
Cu	0	0			(mg/L)	W
Pb	0.001	0			(mg/L)	A
Ni	0	0.01			(mg/L)	W
Se	0.209	0.01	0.203	1.03	(mg/L)	A
Ag	0.03	0			(mg/L)	
Th	0.477	0.01	0.508	0.94	(mg/L)	A
U-Total	NR		0.036			
^{238}U	NR		0.036			
V	0.63	0.06	0.711	0.89	(mg/L)	A
Zn	4.4	0.44	5.08	0.87	(mg/L)	A
^{241}Am	0.64	0.02	0.635	1.01	(Bq/L)	A
^{134}Cs	NR		82.9			
^{137}Cs	73	8	72.7	1.00	(Bq/L)	A
^{57}Co	96	11	96.8	0.99	(Bq/L)	A
^{60}Co	269	30	270	1.00	(Bq/L)	A
^{55}Fe	NR		97			
^{54}Mn	403	45	395	1.02	(Bq/L)	A
^{63}Ni	NR		157			
^{238}Pu	0.32	0.02	0.32	1.00	(Bq/L)	A
$^{239,240}Pu$	0.01	0.01			(Bq/L)	
^{90}Sr	3.21	0.54	8.19	0.39	(Bq/L)	N
$^{234,233}U$	7.77	0.77	0.428	18.15	(Bq/L)	N
^{238}U	8.23	0.78	0.444	18.54	(Bq/L)	N
^{65}Zn	230	26	220	1.05	(Bq/L)	A

[a] Flags:
A = Result acceptable Bias ≤20%
W = Result acceptable with warning 20% < Bias ≤30%
N = Result not acceptable Bias > 30%
L = Uncertainty potentially too low (for infomation purposes only)
H = Uncertainty potentially too high (for information purposes only)
QL = Detection Limit
RW = Report Warning
NR = Not Reported

Table 5-52. MAPEP 00 S7 December 2000, Paragon Analytics, Inc.

Analyte	Reported Value	Reported Error	MAPEP Value	Reported/ MAPEP	Units	Evaluation[a]
As	8.16				mg/kg	A
Ba	459		425.3	1.08	mg/kg	A
Be	89.3		84.9	1.05	mg/kg	A
Cd	13.2		14.27	0.93	mg/kg	A
Cr	22.5		27.1	0.83	mg/kg	A
Pb	67.8		61.3	1.11	mg/kg	A
Ni	44.1		44.3	1.00	mg/kg	A
Se	9.29		7.46	1.25	mg/kg	W
U-Total	NR		7.53			
^{238}U	NR		7.48			
V	129		122.6	1.05	mg/kg	A
Zn	69.4		80.3	0.86	mg/kg	A
^{241}Am	59	7.66	61.1	0.97	Bq/kg	A
^{134}Cs	937	118	1,047	0.89	Bq/kg	A
^{137}Cs	976	123	930	1.05	Bq/kg	A
^{57}Co	959	121	949	1.01	Bq/kg	A
^{60}Co	1,160	146	1,180	0.98	Bq/kg	A
^{54}Mn	1,130	143	1,023	1.10	Bq/kg	A
^{63}Ni	975	126	960	1.02	Bq/kg	A
^{238}Pu	0.5063	0.239			Bq/kg	A
$^{239,240}Pu$	69.9	8.72	74.4	0.94	Bq/kg	A
^{40}K	739	102	652	1.13	Bq/kg	A
^{90}Sr	319.4	58	304	1.05	Bq/kg	A
$^{234,233}U$	88.7	11.2	90	0.99	Bq/kg	A
^{235}U	7.65	1.33			Bq/kg	
^{238}U	89.3.	11.2	93		Bq/kg	A
^{65}Zn	1,680	218	1,540	1.09	Bq/kg	A
Phenol	727		589	1.23	µg/kg	A
1,3-dichlorobenzene	382		333	1.15	µg/kg	A
Nitrobenzene	611		546	1.12	µg/kg	A
2-Nitrophenol	NR		104			
Naphthalene	583		517	1.13	µg/kg	A
2,6-Dichlorophenol	NR		230		µg/kg	
2,4 Dinitrotoluene	747		708	1.06	µg/kg	A
2,4 Dinitrophenol	546		629	0.87	µg/kg	A
Diethylphthalate	1,040		1,038	1.00	µg/kg	A
Anthracene	NR		155			
Pyrene	545		444	1.23	µg/kg	A
Benzo(a)anthracene	660		594	1.11	µg/kg	A
Bis(2-ethylhexyl)phthalat	5,130		5,420	0.95	µg/kg	A

[a] Flags:
A = Result acceptable Bias ≤20%
W = Result acceptable with warning 20% < Bias ≤30%
N = Result not acceptable Bias ≤30%
L = Uncertainty potentially too low (for information purposes only)
H = Uncertainty potentially too high (for information purposes only)
QL = Detection Limit
RW = Report Warning
NR = Not Reported

Table 5-53. MAPEP 00 S7 December 2000, General Engineering Laboratories

Analyte	Reported Value	Reported Error	MAPEP Value	Reported/ MAPEP	Units	Evaluation[a]
As	6.84	1.37			mg/kg	A
Ba	435	87	425.3	1.02	mg/kg	A
Be	81.7	16.3	84.9	0.96	mg/kg	A
Cd	12	2.4	14.27	0.84	mg/kg	A
Cr	24.1	4.82	27.1	0.89	mg/kg	A
Pb	60	12	61.3	0.98	mg/kg	A
Ni	41.9	8.38	44.3	0.95	mg/kg	A
Se	6.83	1.37	7.46	0.92	mg/kg	A
Tl	0.379	0.076			mg/kg	A
U-Total	NR		7.53			
^{238}U	NR		7.48			
V	126	25.2	122.6	1.03	mg/kg	A
Zn	69.1	13.8	80.3	0.86	mg/kg	A
^{241}Am	64.1	15.7	61.1	1.05	Bq/kg	A
^{134}Cs	901	117	1,047	0.86	Bq/kg	A
^{137}Cs	1,020	160	930	1.10	Bq/kg	A
^{57}Co	1,040	126	949	1.10	Bq/kg	A
^{60}Co	1,330	130	1,180	1.13	Bq/kg	A
^{55}Fe	652	30.8			Bq/kg	N
^{54}Mn	1,210	197	1,023	1.18	Bq/kg	A
^{63}Ni	668	63.5	960	0.70	Bq/kg	N
^{238}Pu	–0.546	25.8			Bq/kg	A
^{239,240}Pu	62.3	14.8	74.4	0.84	Bq/kg	A
^{40}K	844	106	652	1.29	Bq/kg	W
^{90}Sr	146	5.39	304	0.48	Bq/kg	N
^{234,233}U	77.7	20.1	90	0.86	Bq/kg	A
^{238}U	96.4	23.1	93	1.04	Bq/kg	A
^{65}Zn	1,990	232	1,540	1.29	Bq/kg	W
Phenol	677		589	1.15	µg/kg	A
1,3-Dichlorobenzene	385		333	1.16	µg/kg	A
Nitrobenzene	498		546	0.91	µg/kg	A
2-Nitrophenol	NR		104			
Naphthalene	471		517	0.91	µg/kg	A
2,6-Dinitrotoluene	1,300		1,572	0.83	µg/kg	A
2,4-Dinitrotoluene	614		708	0.87	µg/kg	A
2,4Dinitrophenol	793		629	1.26	µg/kg	A
4-Nitrophenol	NR		56.4			
Diethylphthalate	930		1,038	0.90	µg/kg	A
Anthracene	146		155	0.94	µg/kg	A
Pyrene	382		444	0.86	µg/kg	A
Benso(a)anthracene	460		594	0.77	µg/kg	A
Bis(2-ethylhexyl)phthalat	NR		5,420			

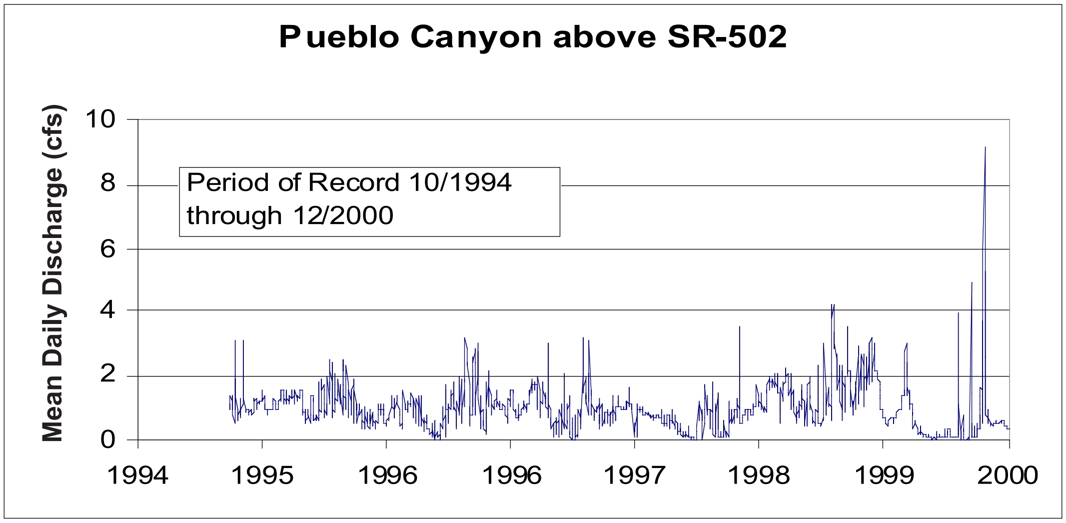
[a] Flags:
A = Result acceptable Bias ≤20%
W = Result acceptable with warning 20% < Bias ≤30%
N = Result not acceptable Bias ≤30%
L = Uncertainty potentially too low (for information purposes only)
H = Uncertainty potentially too high (for information purposes only)
QL = Detection Limit
RW = Report Warning
NR = Not Reported

Table 5-54. MAPEP 00 S7 November 2000, Chemical Sciences and Technology Division, Los Alamos National Laboratory

Analyte	Reported Value	Reported Error	MAPEP Value	Reported/ MAPEP	Units	Evaluation[a]
As	5.57	0.50			mg/kg	A
Ba	383.3	38.30	425.3	.90	mg/kg	A
Be	76.33	7.63	84.9	.90	mg/kg	A
Cd	12.33	1.23	14.27	.86	mg/kg	A
Cr	25.67	2.57	27.1	.95	mg/kg	A
Pb	65.67	2.00	61.3	1.07	mg/kg	A
Ni	37.33	4.22	44.3	.84	mg/kg	A
Se	6.07	0.53	7.46	.81	mg/kg	A
Tl	0.2	0.01			mg/kg	A
$^{Total}U$	NR		7.53			
^{238}U	NR		7.48			
V	106.7	10.70	122.6	.87	mg/kg	A
Zn	78.67	7.87	80.3	.98	mg/kg	A
^{241}Am	NR		61.1			
^{134}Cs	824	92.00	1,047	.79	Bq/kg	W
^{137}Cs	790	88.00	930	.83	Bq/kg	A
^{57}Co	782	87.00	949	.82	Bq/kg	A
^{60}Co	1,009	112.00	1,180	.85	Bq/kg	A
^{54}Mn	900	100.00	1,023	.88	Bq/kg	A
^{63}Ni	NR		960			
^{238}Pu	0.36	0.06			Bq/kg	N
$^{239,240}Pu$	50.7	1.50	74.4	.68	Bq/kg	N
^{40}K	547	66.00	652	.84	Bq/kg	A
^{90}Sr	NR		304			
$^{234,233}U$	66.2	2.80	90	.74	Bq/kg	W
^{238}U	69.2	2.90	93	.74	Bq/kg	W
^{65}Zn	1,387	155.00	1,540	.90	Bq/kg	A

[a] Flags:
A = Result acceptable Bias ≤20%
W = Result acceptable with warning 20% < Bias ≤30%
N = Result not acceptable Bias >30%
L = Uncertainty potentially too low (for information purposes only)
H = Uncertainty potentially too high (for information purposes only)
QL = Detection Limit
RW = Report Warning
NR = Not Reported

L. Figures



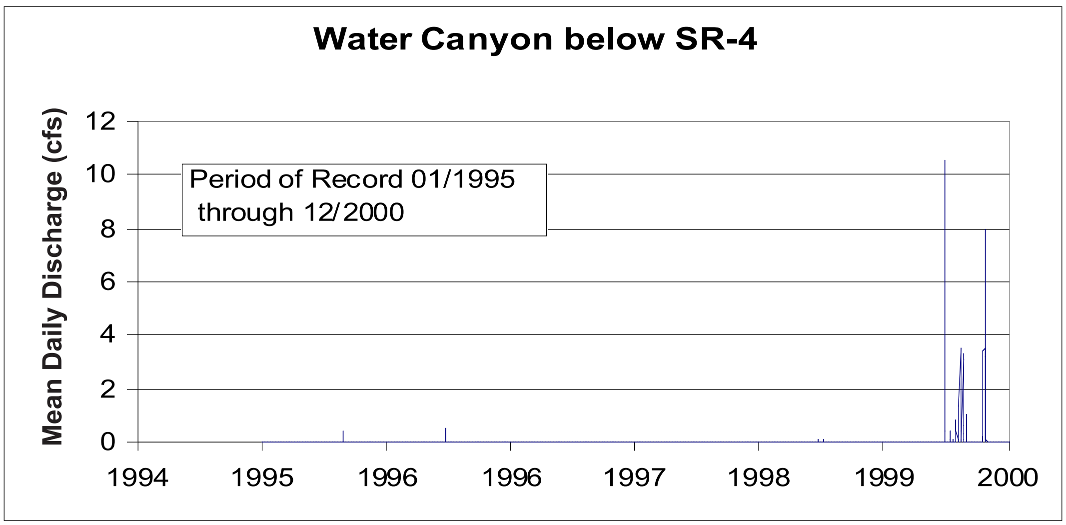


Figure 5-1. Daily average flows (cfs) at gaging stations in lower Pueblo Canyon at State Road 502 (top) and lower Water Canyon below State Road 4 (bottom). Base flow in lower Pueblo Canyon is supported by sanitary effluent discharges from Los Alamos County Bayo wastewater treatment plant. Post-fire runoff yields from summer storms substantially increased in both canyons.

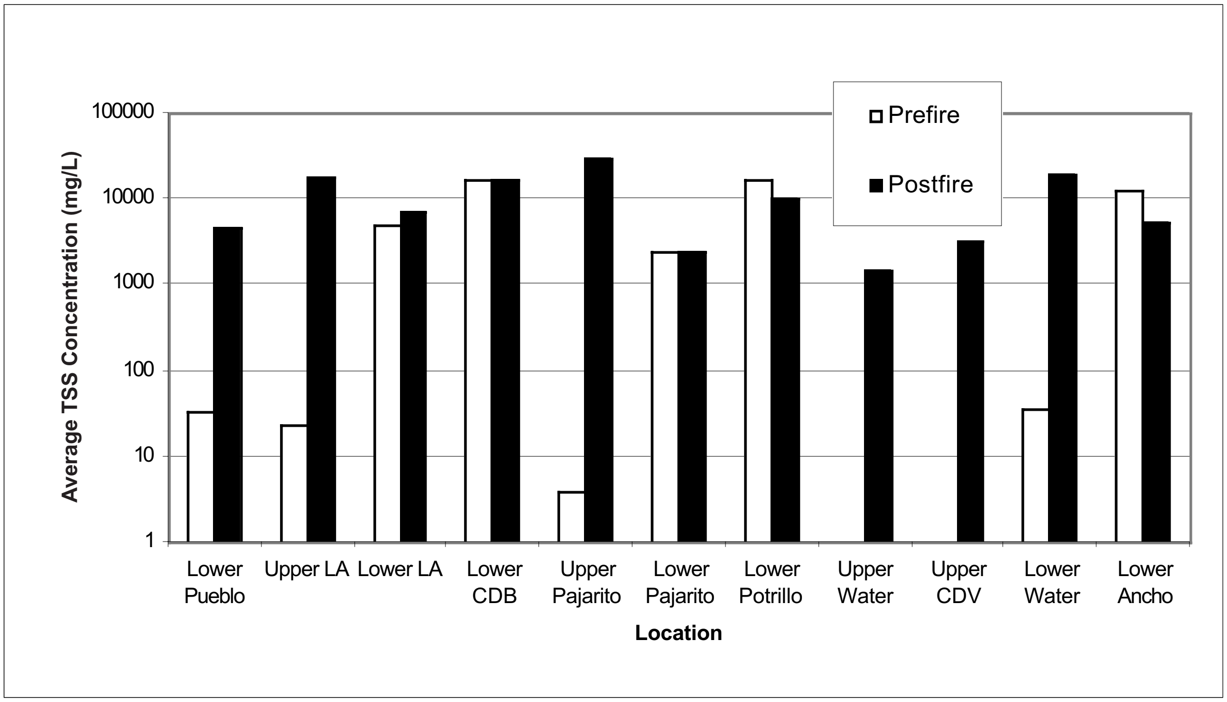


Figure 5-2. Average (volume-weighted) suspended sediment loads in summer runoff before and after the Cerro Grande fire. Note logarithmic scale of chart.

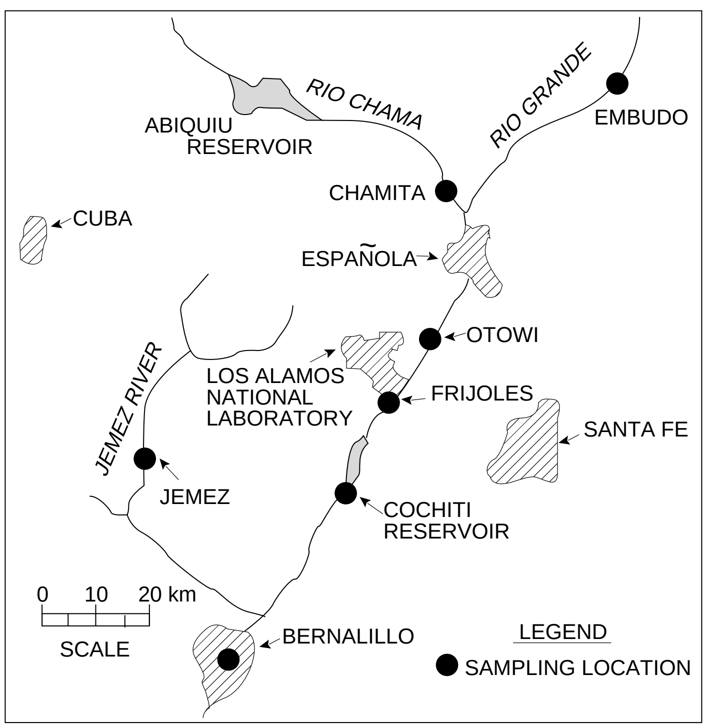


Figure 5-3. Regional surface water and sediment sampling locations.

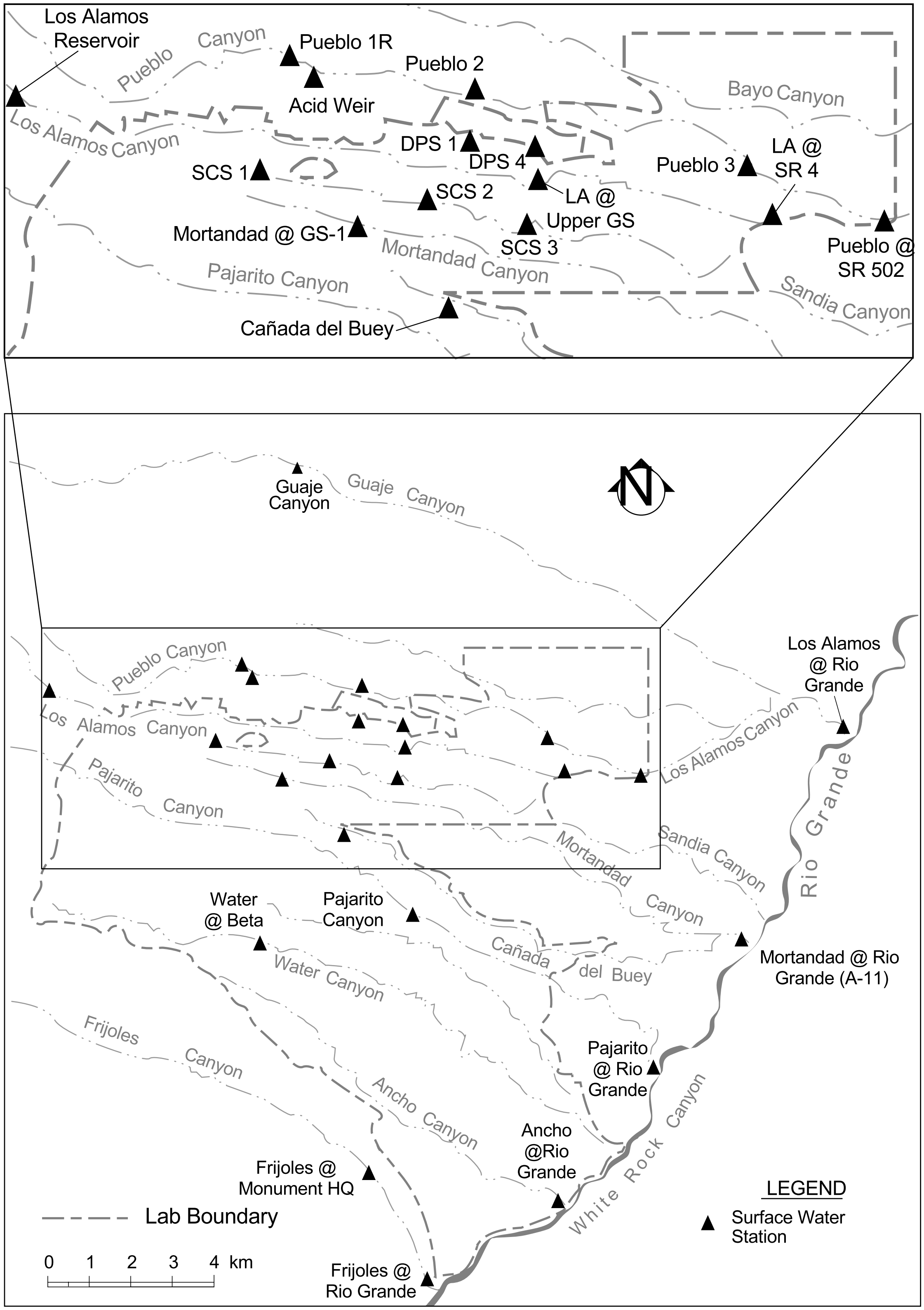


Figure 5-4. Surface water sampling locations in the vicinity of Los Alamos National Laboratory.

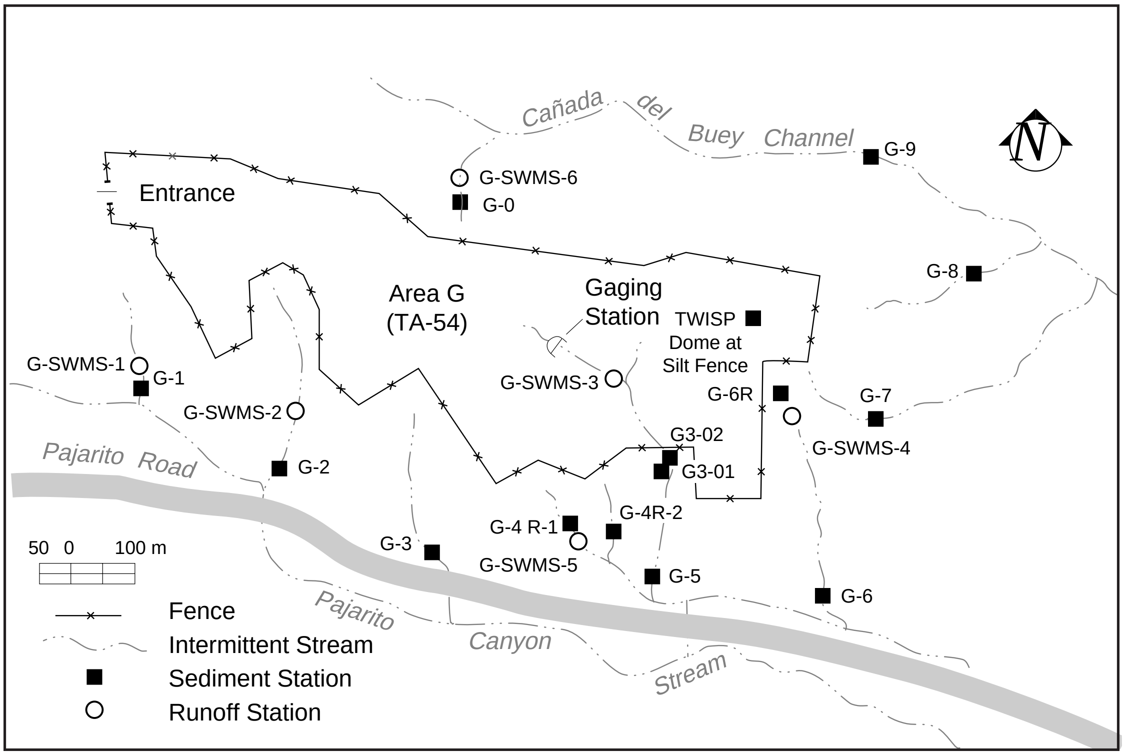


Figure 5-5. Sediment and runoff sampling stations at TA-54, Area G.

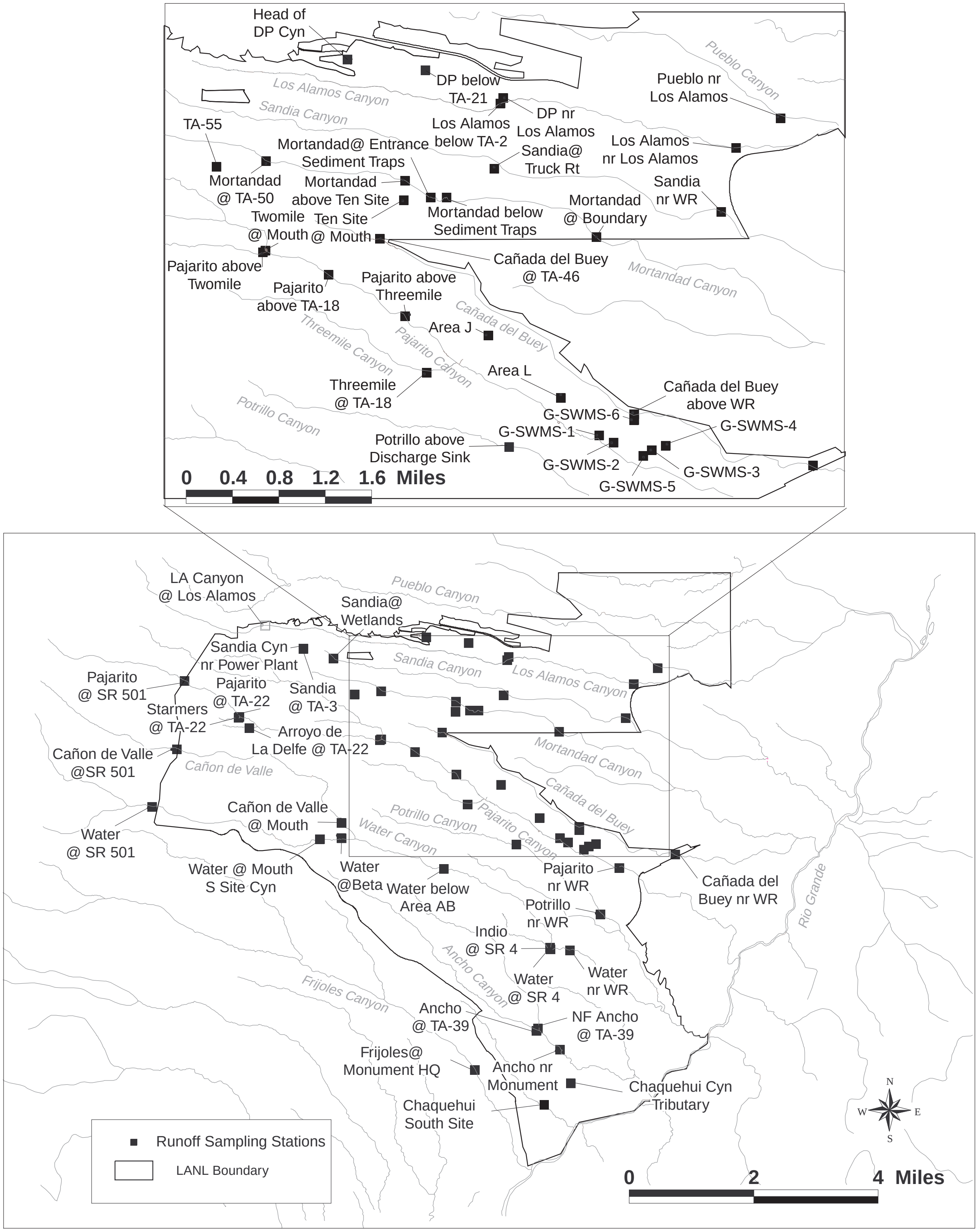


Figure 5-6. Runoff sampling stations in the vicinity of Los Alamos National Laboratory.

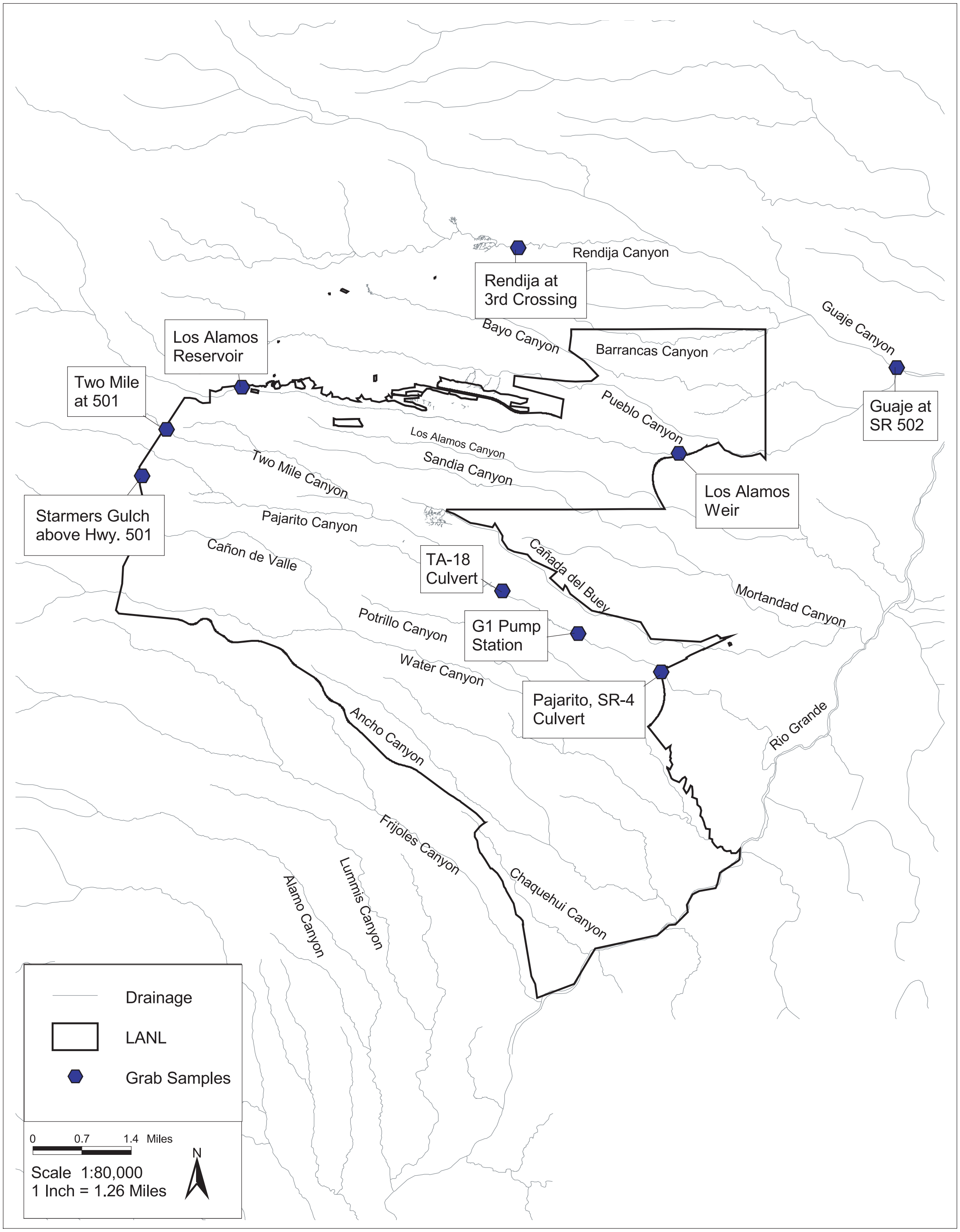


Figure 5-7. Locations of runoff grab samples collected during 2000 at LANL.

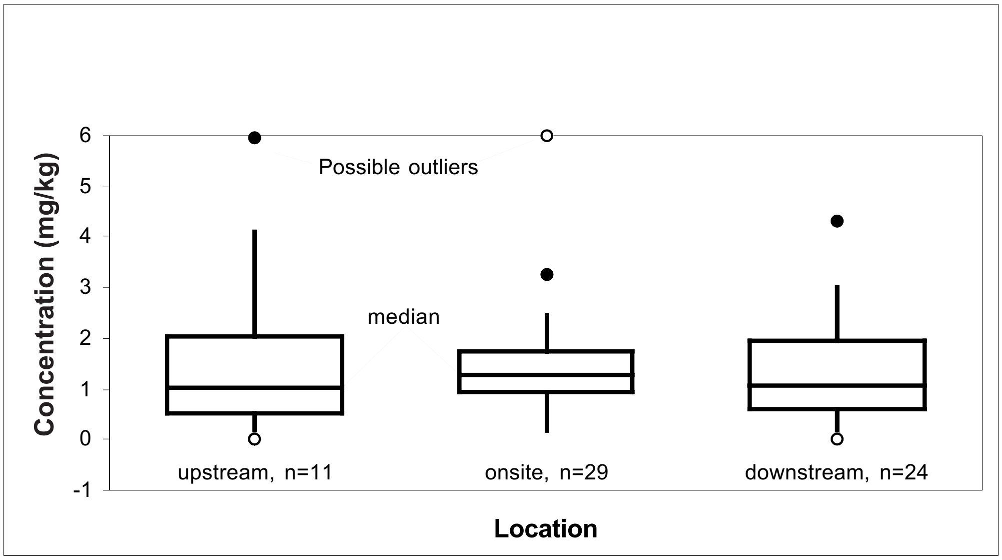


Figure 5-8. Box plot of uranium concentrations in suspended sediment in 2000 runoff. The box plots summarize the distribution of concentrations in upstream, on-site, and downstream stations. The line in the middle of the box identifies the median concentration. The upper and lower ends of the box contain the middle 50% or so of the data. The lines above and below the box indicate the 10th and 90th percentiles.

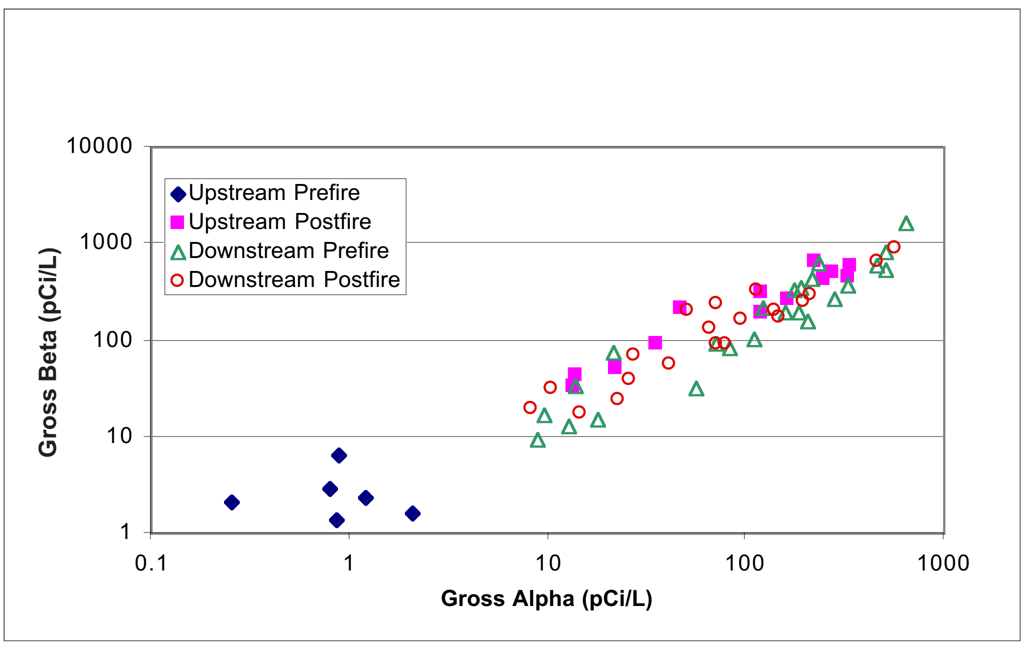


Figure 5- 9. Gross alpha and gross beta in unfiltered runoff pre-fire and post-fire. Note logarithmic scales of chart axes. Along the upstream boundary of the Laboratory, the concentrations of alpha and beta activity in runoff increased by 10-fold or more after the fire. The increase is largely related to the increased sediment load in the upstream samples after the fire. The sediment contains naturally occurring radioactivity from uranium, thorium, and potassium elements.

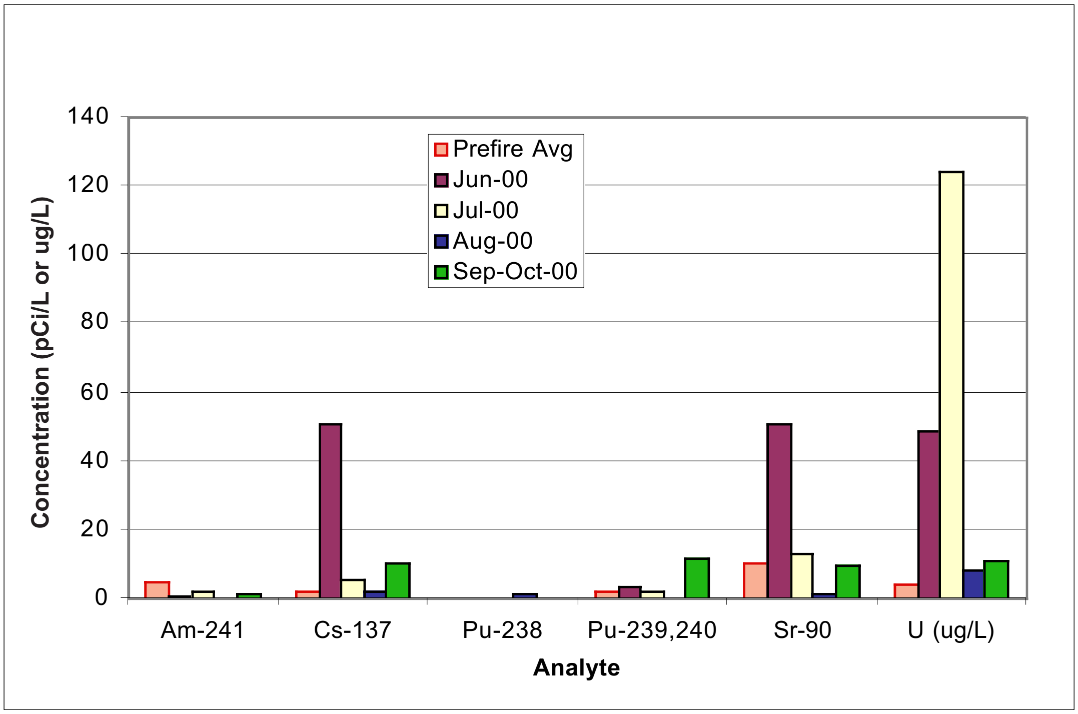


Figure 5-10. Monthly average (flow-weighted) radionuclide concentrations in unfiltered runoff at LANL downstream stations.

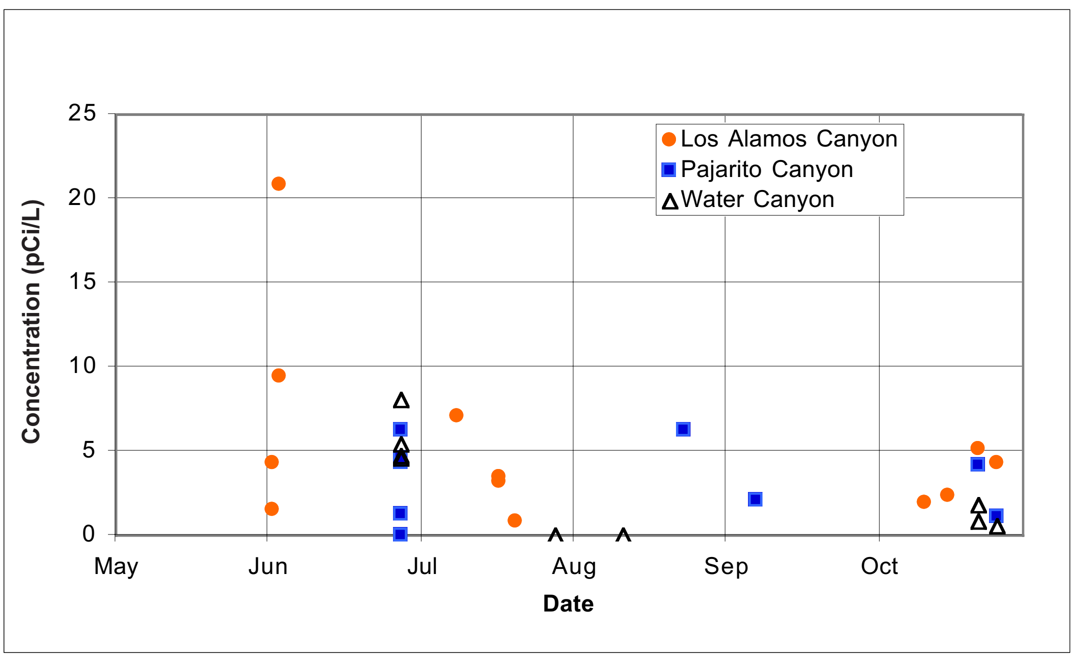
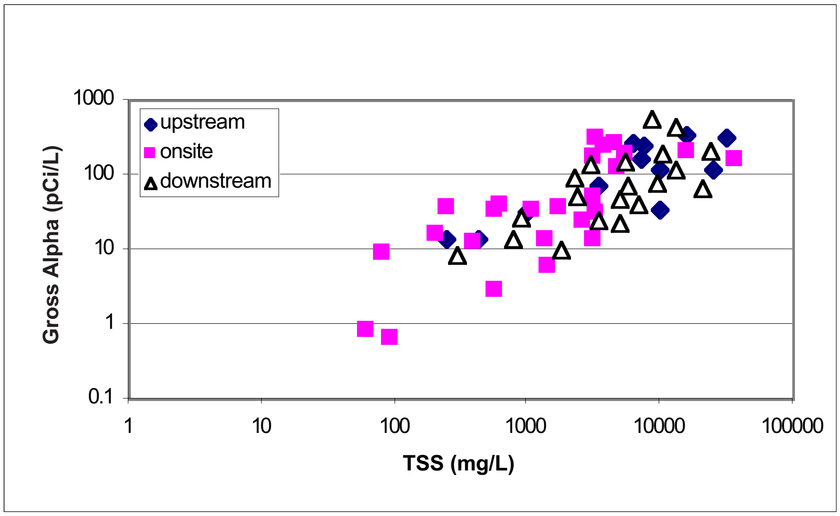


Figure 5-11. Cesium-137 concentrations in suspended sediment in runoff. Data from various stations in Los Alamos, Pajarito, and Water Canyons.



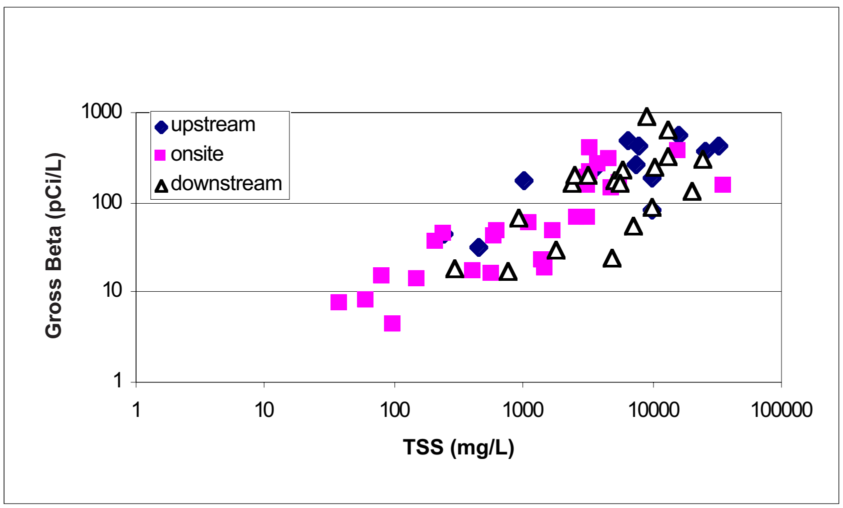


Figure 5-12. Comparison of gross alpha (top) and gross beta (bottom) activities to the total suspended solids (TSS) concentrations in unfiltered 2000 runoff samples. Note that axes use logarithmic scales.

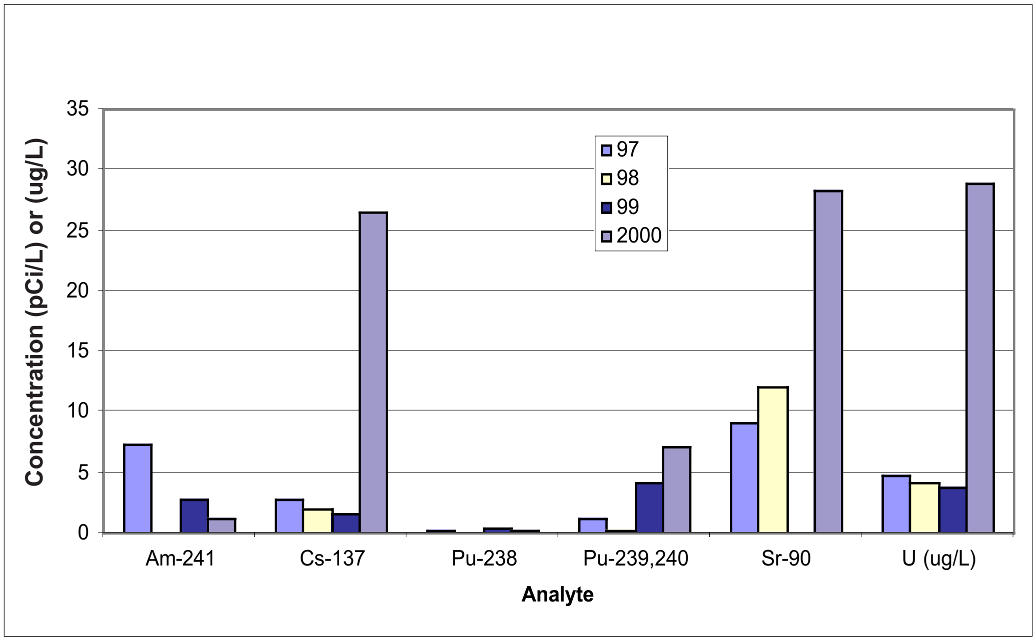


Figure 5-13. Yearly average (flow-weighted) radionuclide concentrations in unfiltered runoff leaving LANL The concentrations of cesium-137, strontium-90, uranium, and possibly plutonium-239, -240 significantly increased in 2000 from prior years.

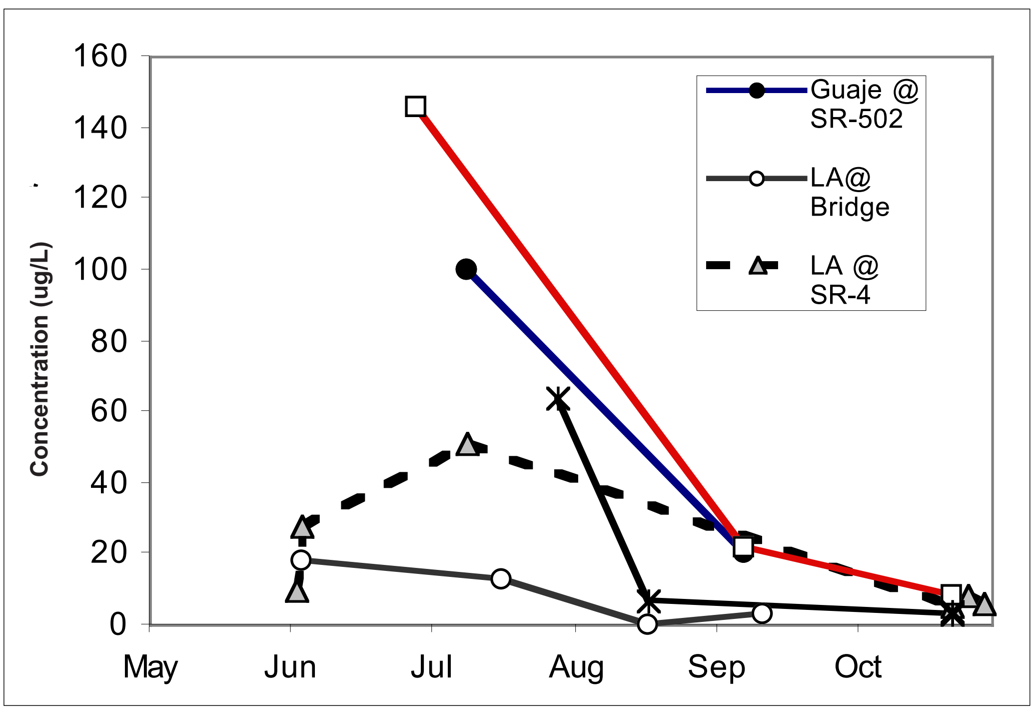


Figure 5-14. Total cyanide levels in runoff during 2000.

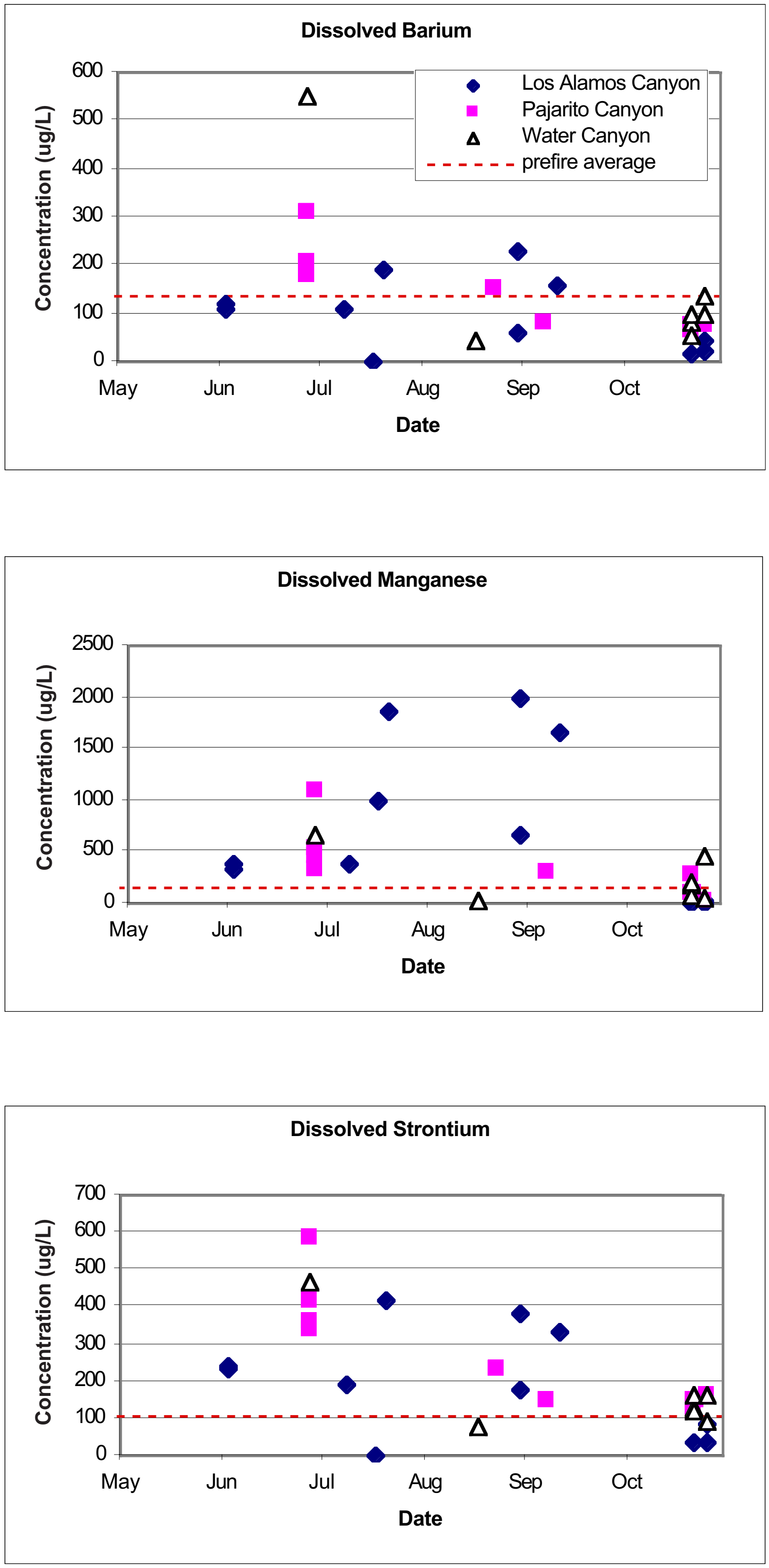
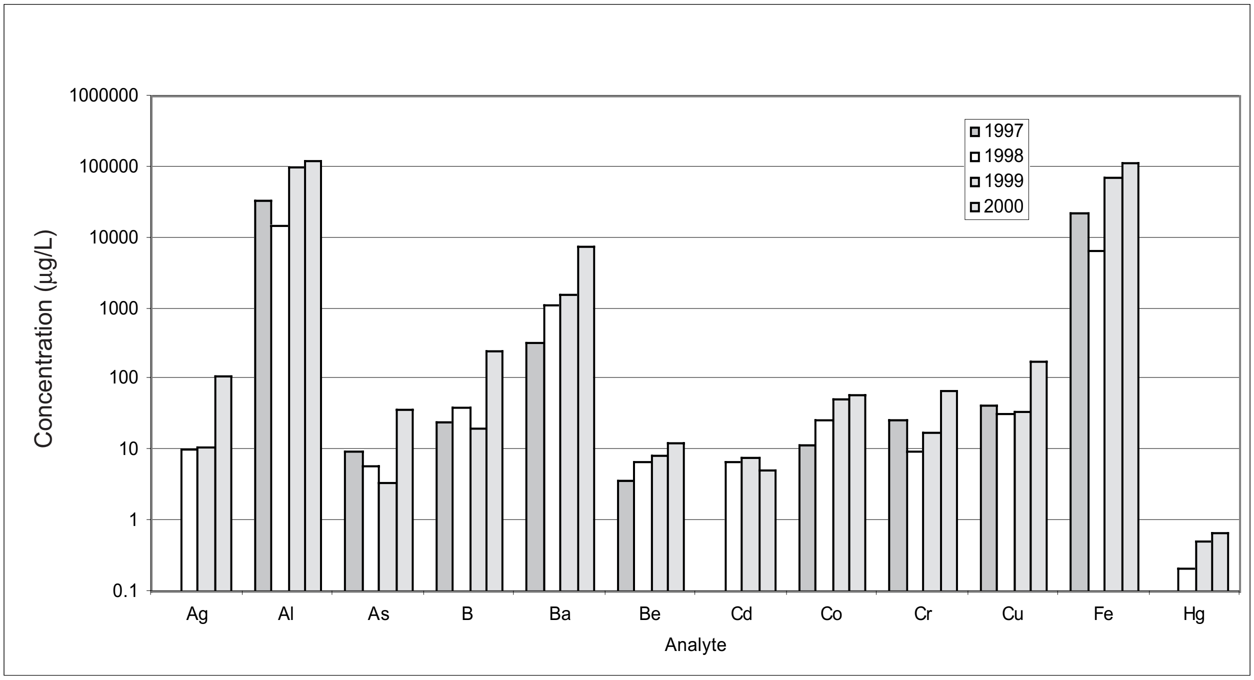


Figure 5-15. Dissolved metals concentrations in runoff for various stations in Los Alamos, Pajarito, and Water Canyons.



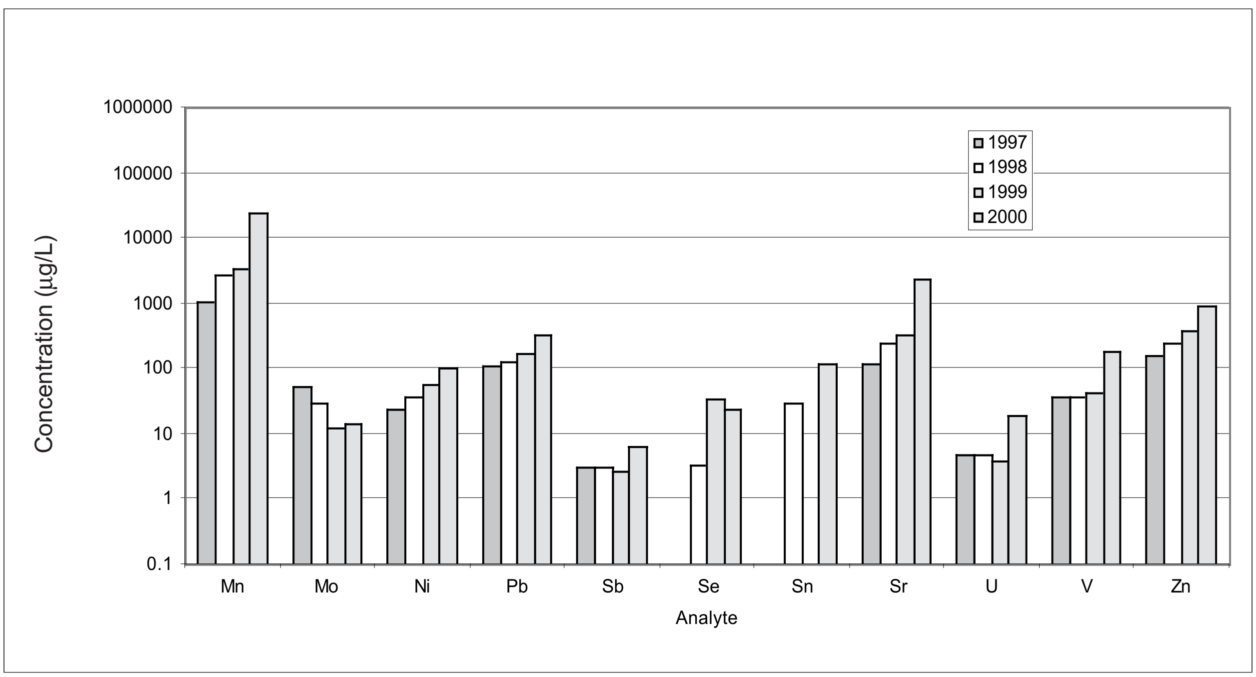


Figure 5-16. Log of yearly average (flow-weighted) metals concentrations in unfiltered runoff leaving LANL.

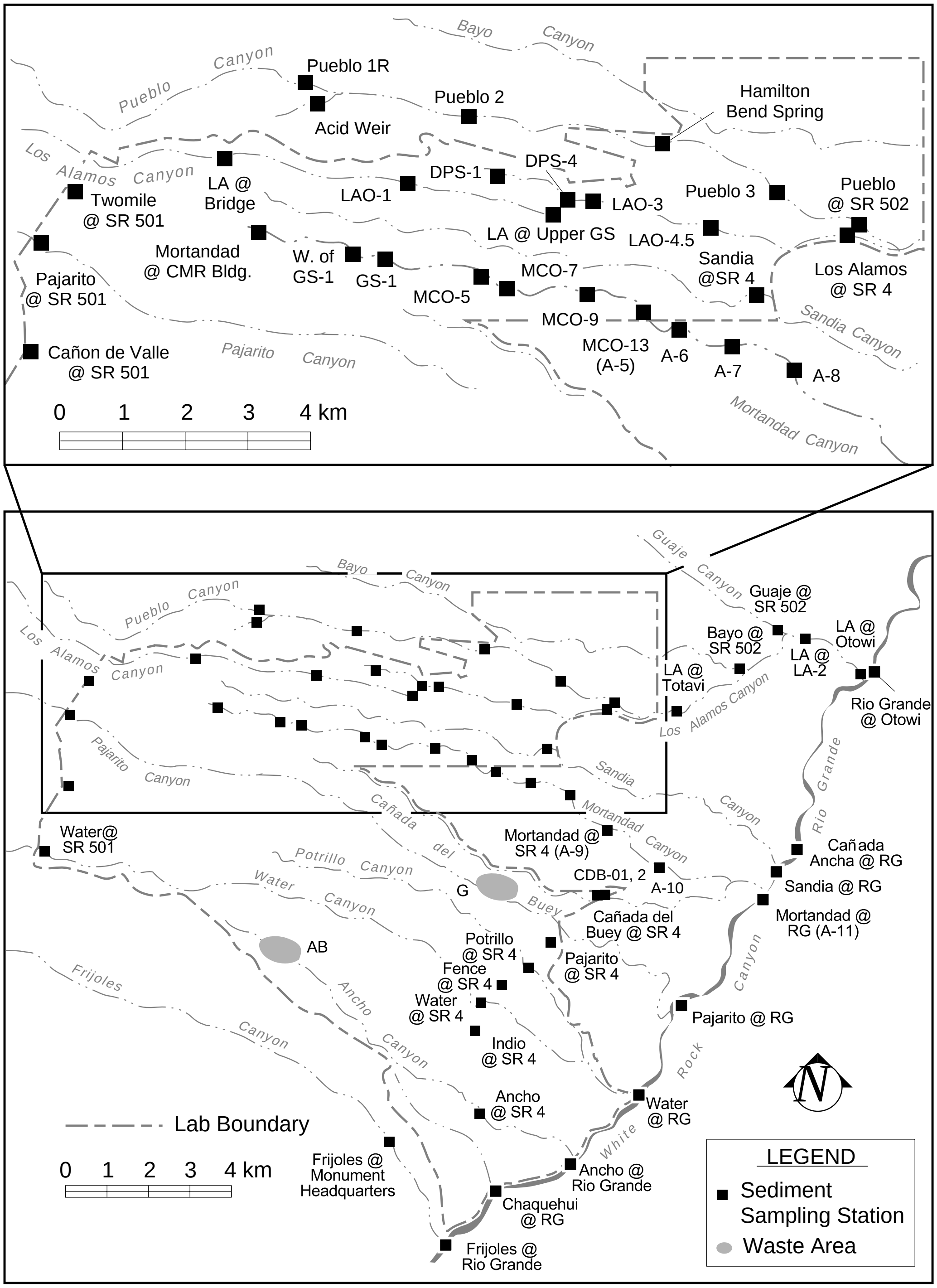


Figure 5-17. Sediment sampling stations on the Pajarito Plateau near Los Alamos National Laboratory. Solid waste management areas with multiple sampling locations are shown in Figure 5-5.

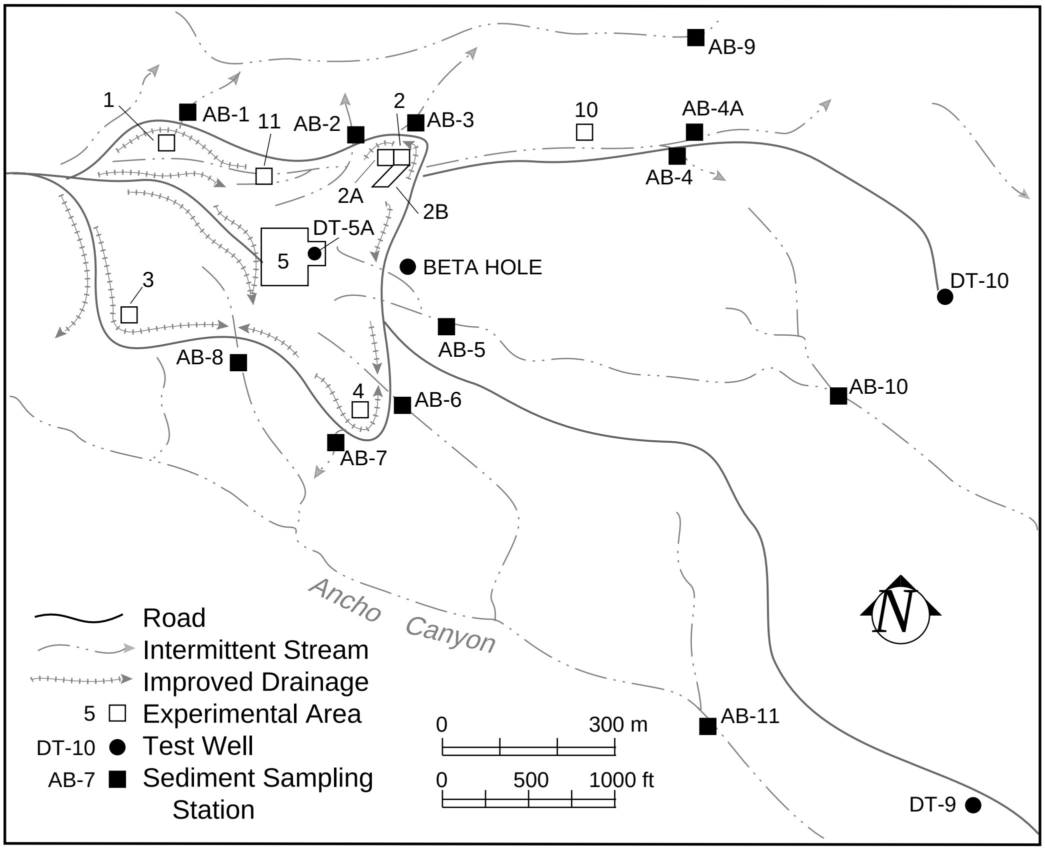
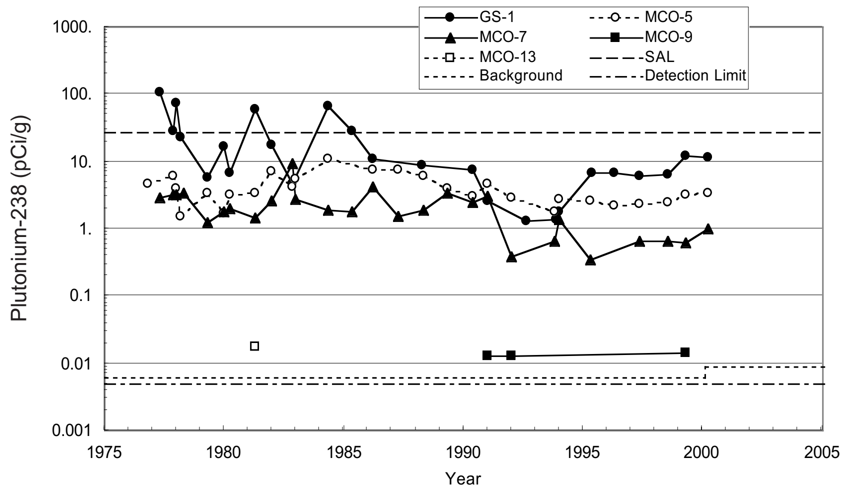
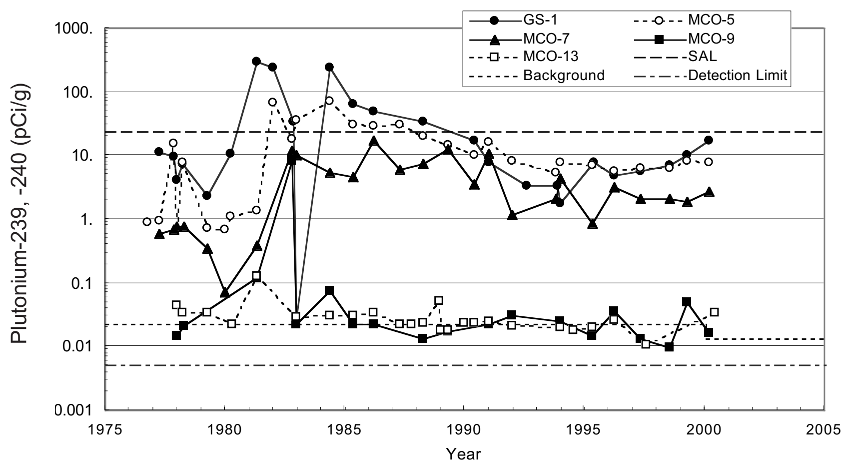


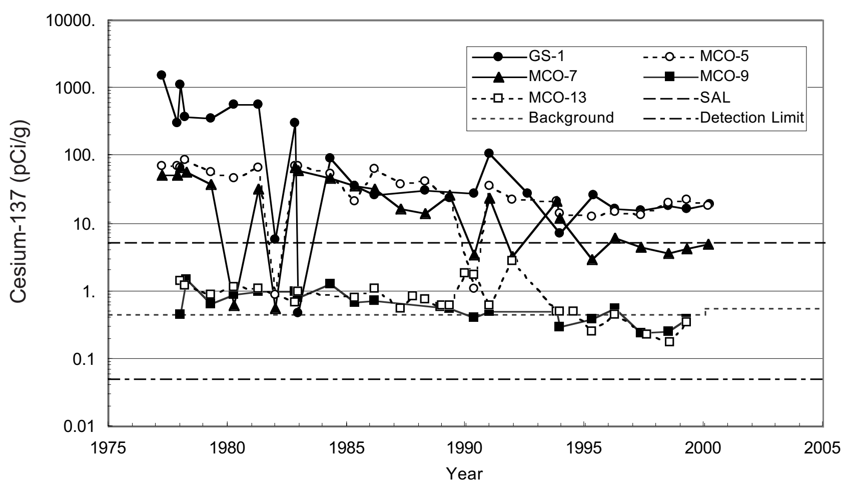
Figure 5-18. Sediment sampling stations at Technical Area 49, Area AB.



a. Plutonium-238 on Laboratory lands in Mortandad Canyon.



b. Plutonium-239, -240 on Laboratory lands in Mortandad Canyon.



c. Cesium-137 on Laboratory lands in Mortandad Canyon.

Figure 5-19. Sediment radioactivity histories for stations located on Laboratory lands in Mortandad Canyon. Only detections are shown, although data are available for most years.

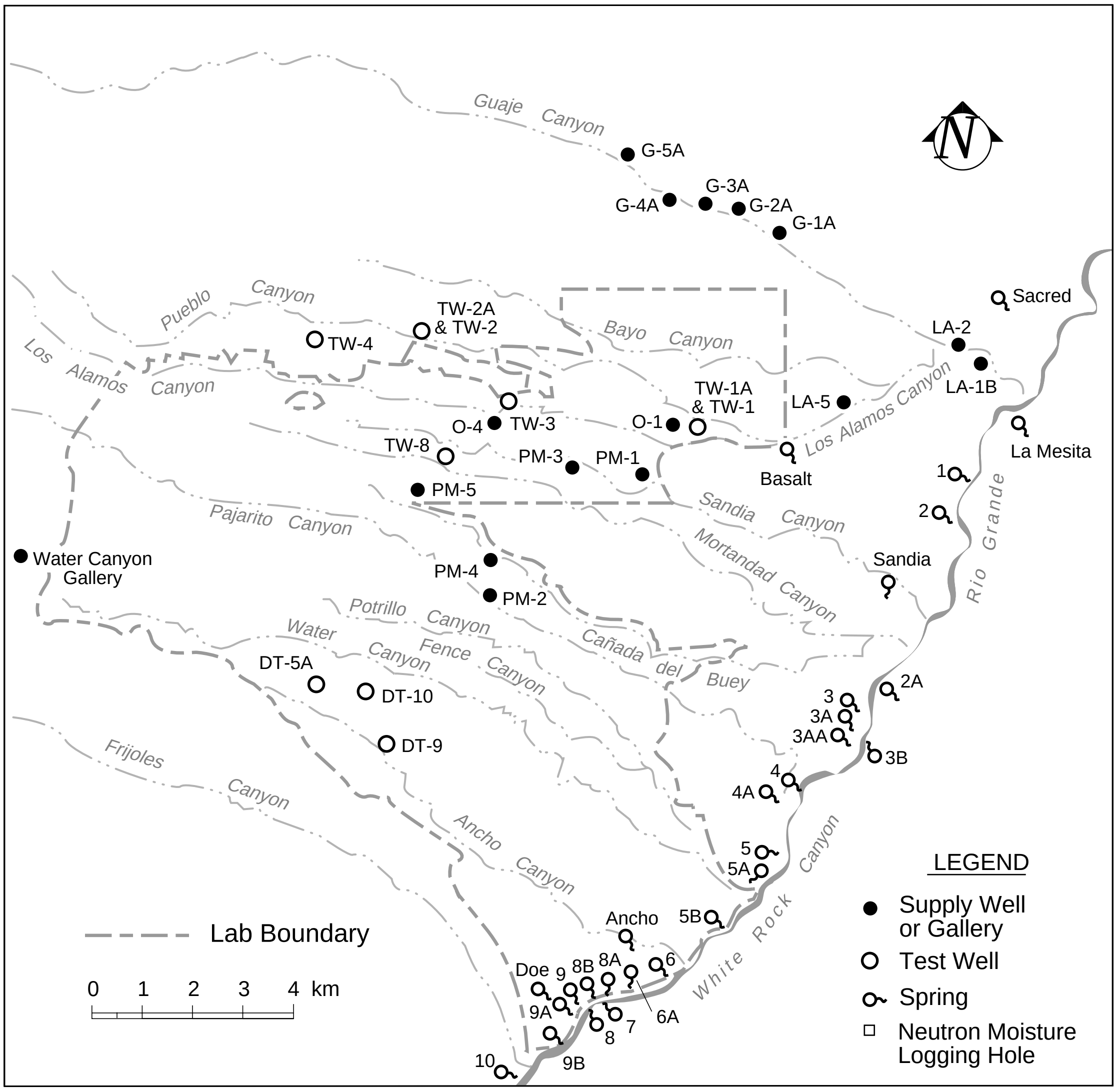


Figure 5-20. Springs and deep and intermediate wells used for groundwater sampling.

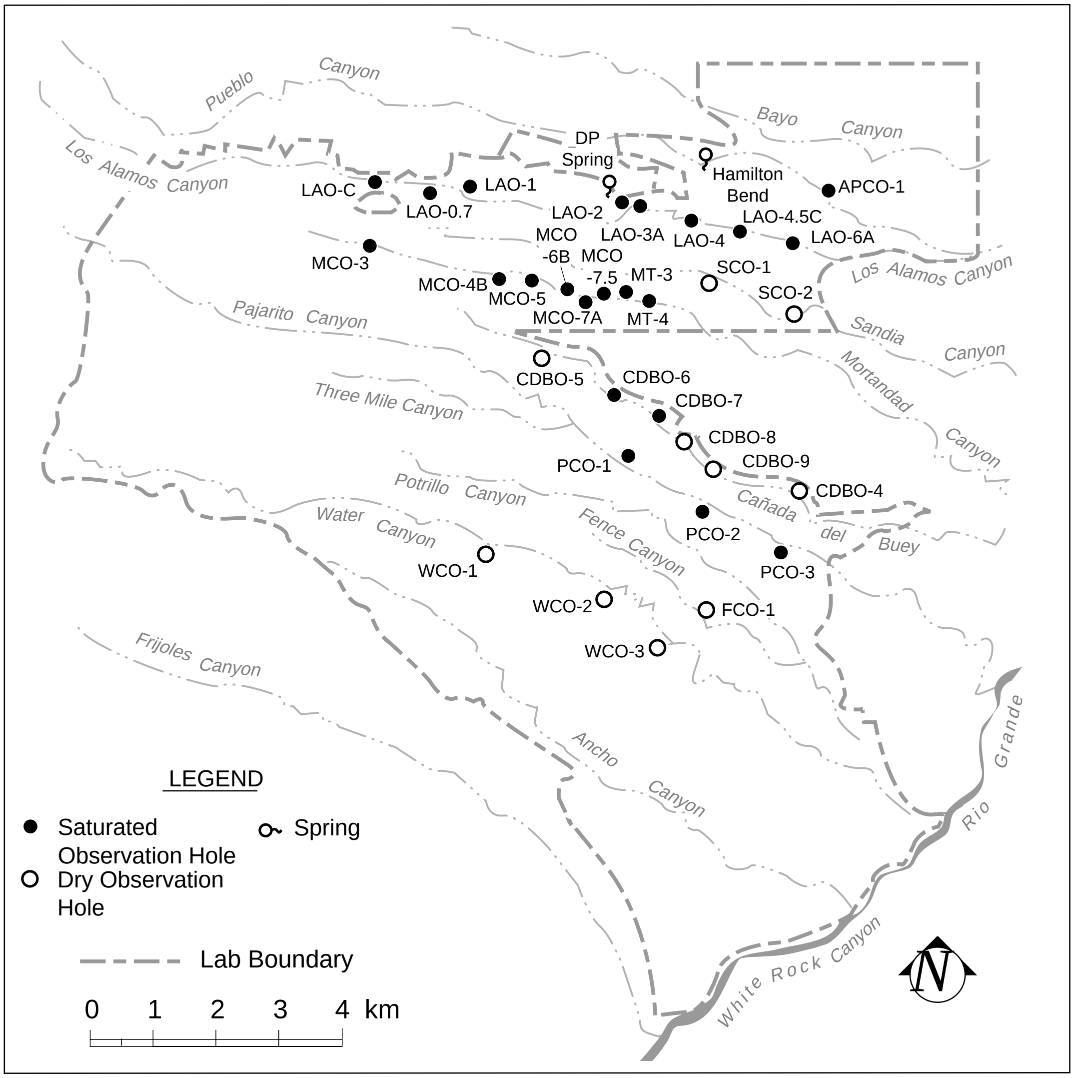
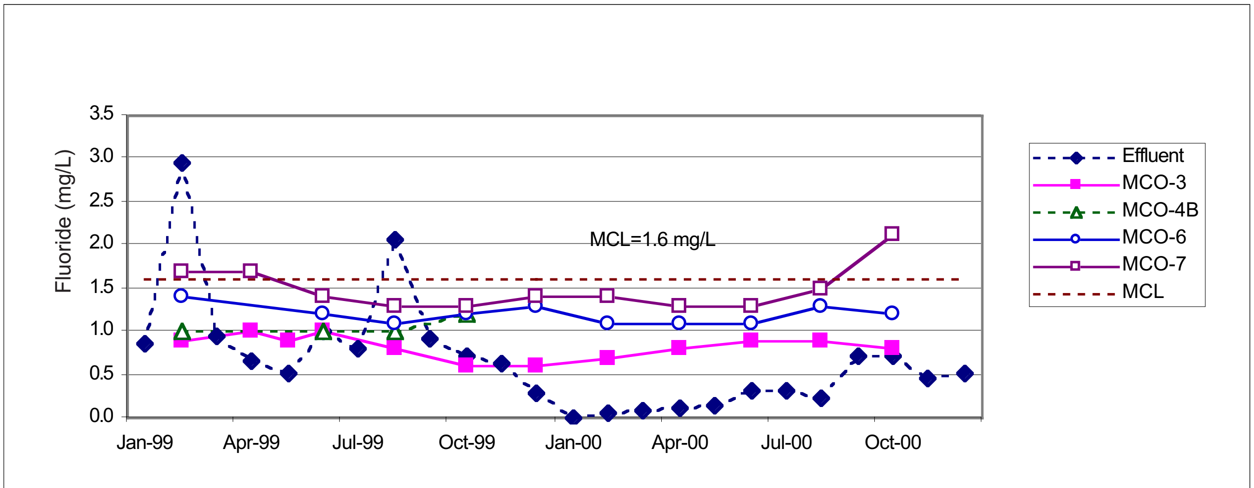
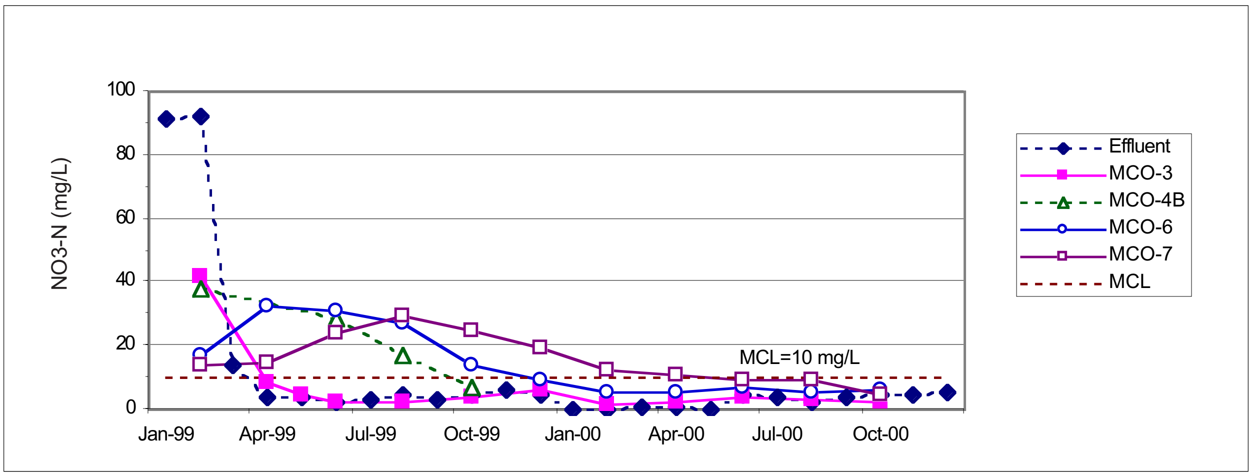


Figure 5-21. Observation wells and springs used for alluvial groundwater sampling.

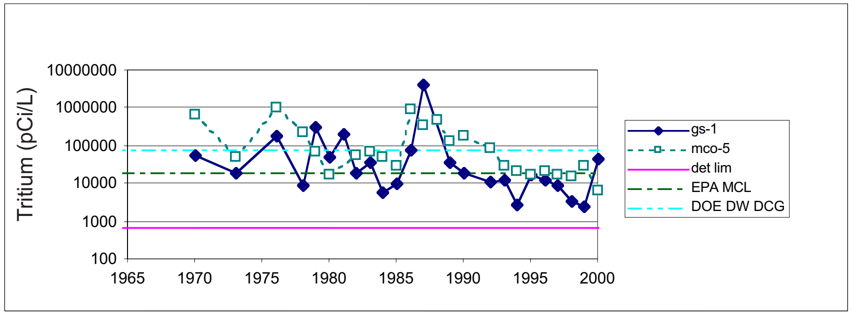


a. Fluoride

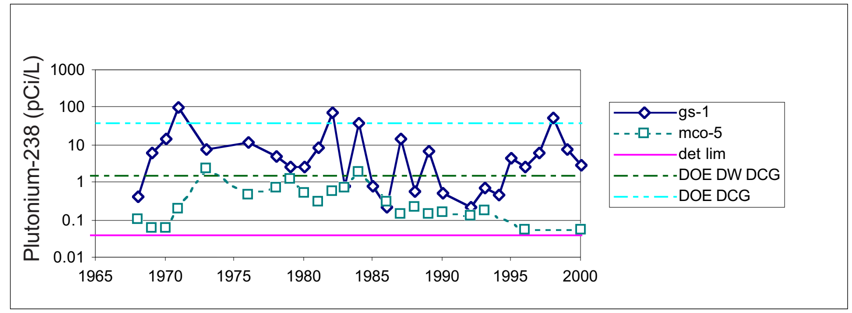


b. Nitrate

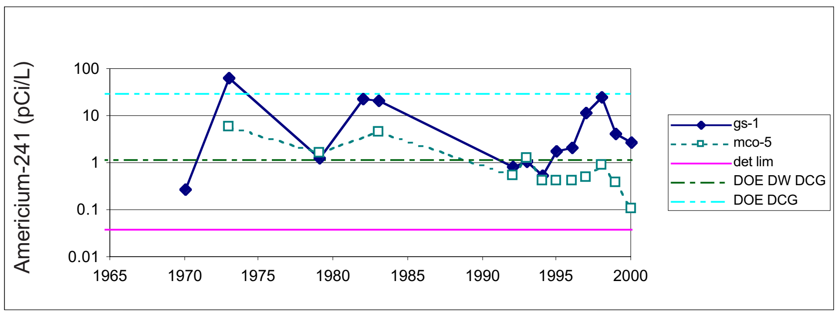
Figure 5-22. Fluoride and nitrate in Mortandad Canyon alluvial groundwater in 1999 and 2000.



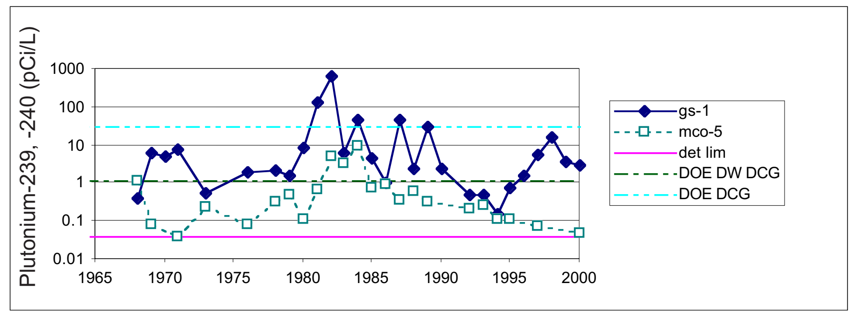
a. Mortandad Canyon tritium



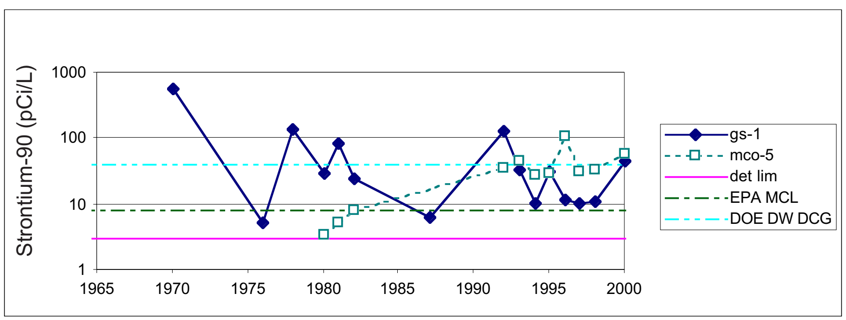
b. Mortandad Canyon plutonium-238



c. Mortandad Canyon americium-241



d. Mortandad Canyon plutonium-239, -240



e. Mortandad Canyon strontium-90

Figure 5-23. Annual average radioactivity in surface water and groundwater from Mortandad Canyon.

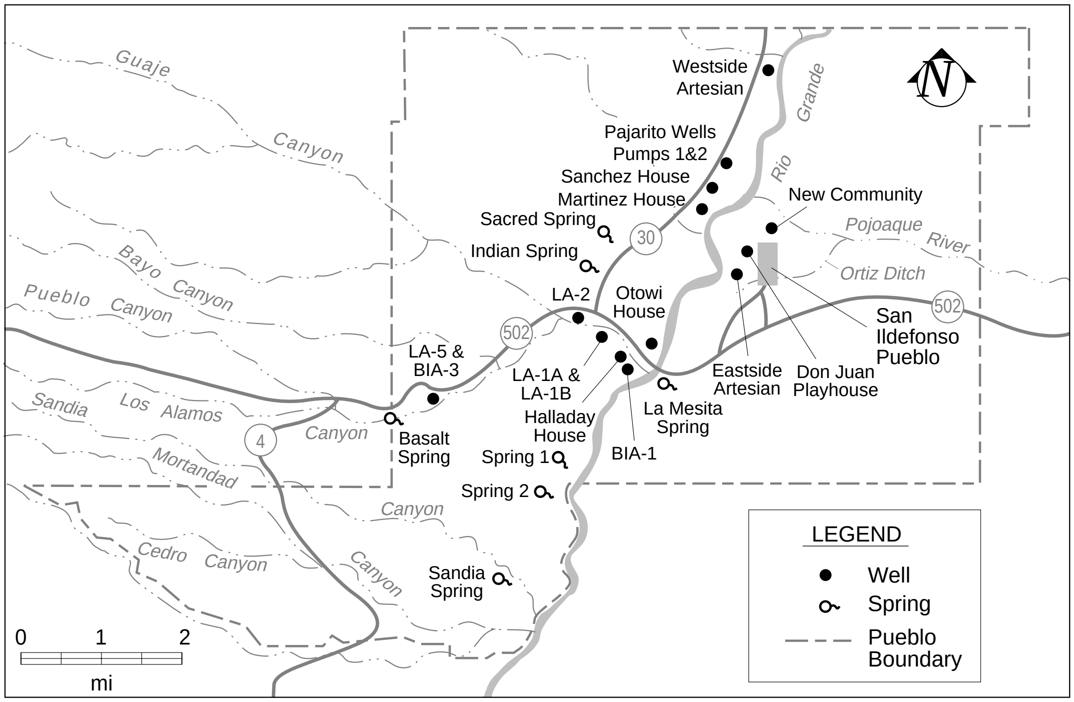


Figure 5-24. Springs and groundwater stations on or adjacent to San Ildefonso Pueblo land.

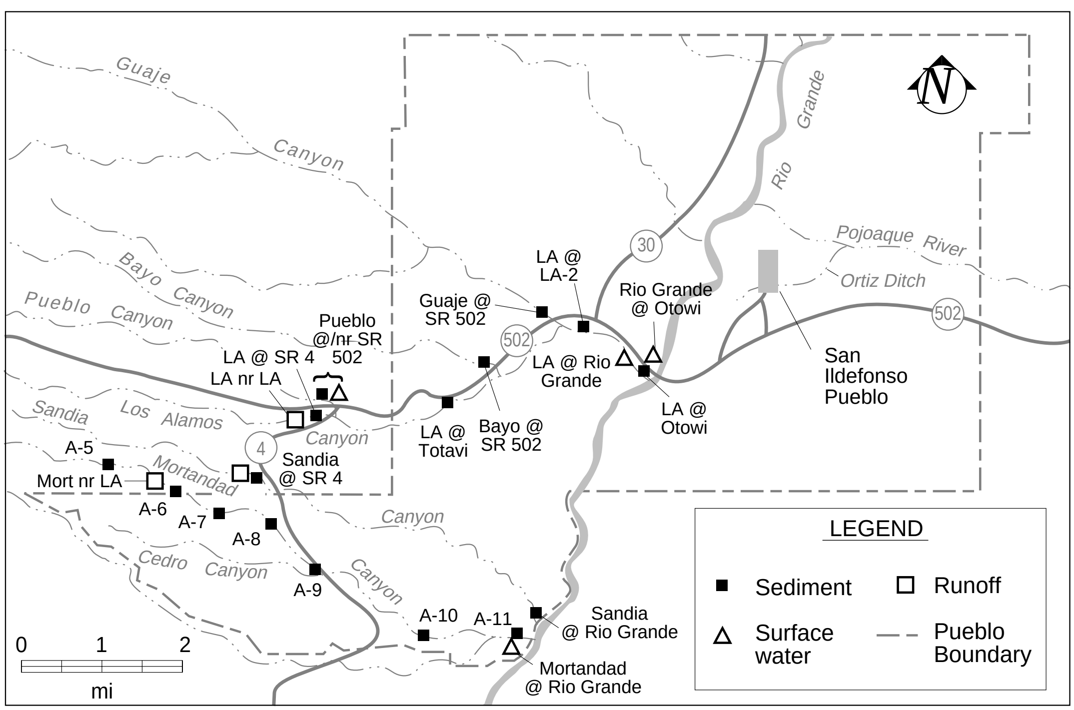


Figure 5-25. Sediment and surface water stations on or adjacent to San Ildefonso Pueblo land.

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6. Soil, Foodstuffs, and Associated Biota

6. Soil, Foodstuffs, and Associated Biota

contributing authors:

Philip Fresquez, Gilbert Gonzales, Tim Haarmann, John Nyhan, Bruce Gallaher

Abstract

Soil samples were collected from 12 on-site and 10 perimeter areas around Los Alamos National Laboratory (LANL or the Laboratory). We analyzed the samples for radiological, trace element, and organic constituents and compared the results with soils collected from regional background locations in northern New Mexico. These samples, which were collected after the Cerro Grande fire—a catastrophic wildfire that burned nearly 50,000 acres, including 7,500 at LANL—were compared with samples collected in 1999. In addition, we collected soil samples at selected (garden) farming locations downwind of the Cerro Grande fire, analyzed them for radiological and nonradiological constituents, and compared them with soil samples collected upwind of the fire to determine if smoke and fallout ash impacted soil farming resources. All radionuclide concentrations (activity) in soils were low, and most were nondetectable or within upper-level regional background concentrations. Similarly, most trace elements, with the exception of beryllium and lead, in soils from on-site and perimeter areas were within regional background concentrations; most organic constituents, with the exception of 1,2,3,4,6,7,8,9-octachlorodibenzo-p-dioxin (OCDD) at pg/g levels, at all sites were nondetectable. Most mean radionuclide and trace element concentrations in soils collected from LANL and perimeter areas after the Cerro Grande fire were statistically (α = 0.05) similar to soils collected before the fire in 1999, and the OCDD was not related to the fire.

We collected foodstuffs samples (produce, milk, fish, elk, deer, herbal teas, honey, and wild prickly pear fruit) from Laboratory or surrounding perimeter areas, including several Native American pueblo communities, to determine the potential impact of releases from LANL operations on the human food chain. The concentrations of radionuclides and trace elements in foodstuffs collected from the Laboratory and perimeter locations were low, and most were nondetectable or within upper-level regional background concentrations and, for the most part, were statistically (α = 0.05) indistinguishable from foodstuffs collected before the Cerro Grande fire in 1999. Produce and fish, in particular, because of the concern for airborne contaminants from smoke and fallout ash and contaminants in storm water runoff (e.g., cyanide was elevated possibly because of use in fire retardants and natural combustion of vegetation during the fire), respectively, were not significantly affected.

Biota samples—whole body burdens of polychlorinated biphenyls (PCBs) and organochlorine pesticides in carp and carp sucker—collected from Cochiti and Abiquiu reservoirs showed that, although PCB and dichlorodiphenylethane (DDE) concentrations in Cochiti fish were statistically (α = 0.05) higher than in upstream Abiquiu fish, levels are within regional and national levels and are within limits suggested for the protection of both piscivores and the fish themselves. Additionally, even though PCB and DDE levels decreased from June to July following the Cerro Grande fire, the effect of time was statistically nonsignificant, and comparisons with regional and local data indicate that our measurements may still provide a baseline.

Other environmental surveillance program activities conducted in 2000 included assessing radionuclide and trace elements in soil, vegetation, bees, raccoons, elk, and deer within and around Technical Area (TA) 54, Area G, the Laboratory's primary low-level radioactive waste disposal area, and DARHT, the Laboratory's Dual Axis Radiographic Hydrodynamic Test facility. Special studies included assessing organic biocontaminants in food chains within two canyons at LANL, examining the effects of depleted uranium on amphibians, assessing potential risks from exposure to natural uranium in well water, conducting development surveys of fire effects and rehabilitation treatments after the Cerro Grande fire, and estimating soil erosion in forest areas burned during the Cerro Grande fire.

6. Soil, Foodstuffs, and Associated Biota

A. Soil Monitoring

1. Introduction

A soil sampling and analysis program provides the most direct means of determining the concentration (activity), inventory, and distribution of radionuclides and radioactivity around nuclear facilities (DOE 1991). Department of Energy (DOE) Orders 5400.1 and 5400.5 mandate this program. Soil provides an integrating medium that can account for contaminants released to the atmosphere, either directly in gaseous effluents (such as air stack emissions) or indirectly from resuspension of on-site contamination (such as firing sites and waste disposal areas) or through liquid effluents released to a stream that is subsequently used for irrigation (Purtymun et al., 1987). The knowledge gained from a soil radiological sampling program is critical for providing information about potential pathways (such as soil ingestion, food crops, resuspension into the air, and contamination of groundwater) that may result in a radiation dose to a person (Fresquez et al., 1998a).

The soil surveillance program at Los Alamos National Laboratory (LANL or the Laboratory) consists of an institutional program that monitors soil contaminants within and around LANL and a facility program that monitors soil contaminants directly around the perimeter of major facilities at LANL. The two main facilities where soil monitoring takes place are the Laboratory's principal low-level radioactive waste disposal site (Area G) at Technical Area (TA) 54 and the Dual Axis Radiographic Hydrodynamic Test (DARHT) facility at TA-15.

The main objectives of these programs include evaluating (1) radionuclide and nonradionuclide (trace element and organic) concentrations in soils collected from potentially impacted areas (institution- and facility-wide); (2) trends over time (that is, whether radionuclides and nonradionuclides are increasing or decreasing over time); and (3) committed effective dose equivalent (CEDE) to surrounding area residents. The Ecology Group's (ESH-20's) Contaminant Monitoring Team compares on-site and perimeter areas with regional background areas; background areas are located at such a distance away from the Laboratory that their radionuclide and nonradionuclide contents are mostly due to naturally occurring elements or to worldwide fallout. See Chapter 3 for potential radiation doses to individuals from exposure to soils.

This year, a catastrophic wildfire burned across the Los Alamos area. The fire was fully contained by June 6. Because the fire burned over 7,500 acres of LANL lands and some areas are known to contain radionuclides and chemicals in soils and plants above background concentrations (Fresquez et al., 1998a; Gonzales et al., 2000a), some of these materials may have been suspended in smoke and ash and transported by wind-principally downwind of the fire. The predominant wind direction during the fire was to the northeast of LANL. Therefore, in addition to the samples collected as part of the routine soil (institutional and facility) monitoring program at LANL during 2000, we also collected soil samples at selected (garden) farming locations in northern New Mexico downwind of the Cerro Grande fire and compared them with soil samples collected upwind of the fire to determine the impact of smoke and fallout ash from the Cerro Grande fire on soil farming resources.

2. Institutional Monitoring

a. Monitoring Network. We collect soil surface samples (0- to 2-in. depth) from relatively level, open, and undisturbed areas at regional background locations (four sites), LANL's perimeter (10 sites), and at LANL (12 sites) (see Figure 6-1). Areas sampled at LANL are not from solid waste management units (SWMUs). Instead, the majority of on-site soil-sampling stations are located on mesa tops close to and downwind from major facilities or operations at LANL in an effort to assess radionuclides and nonradionuclides in soils that may have been contaminated as a result of air stack emissions and fugitive dust (the resuspension of dust from SWMUs and active firing sites).

The 10 perimeter stations are located within 4 km (2.5 mi.) of the Laboratory. These stations reflect the soil conditions of the inhabited areas to the north (Los Alamos town site area—four stations) and east (White Rock area and San Ildefonso Pueblo lands—four stations) of the Laboratory. The other two stations, one located on Forest Service land to the west and the other located on Park Service land (Bandelier) to the southwest, provide additional coverage. We compare soil samples from all these areas with soils collected from regional background locations in northern New Mexico surrounding the Laboratory where radionuclides, radioactivity, and trace elements are from natural or worldwide fallout events; these areas are located around Embudo to the north, Cochiti to the south, and Jemez to the southwest. All are more than 32 km (20 mi.) from the Laboratory and are beyond the range of potential influence from normal Laboratory operations (DOE 1991). (Note: This year, because of the Cerro Grande fire, we collected an additional background sample upwind of LANL near the start of the Cerro Grande fire on Bandelier property.)

To determine the potential impact of the Cerro Grande fire on soil farming resources, we collected six soil surface samples from farm gardens north, northeast, south, and southeast of the Cerro Grande fire (and LANL) on June 19–21, 2000. Four of the farms were predominantly downwind of the Cerro Grande fire (Ojo Sarco, Española, Embudo, and Abiquiu), whereas the other two were southeast (Pecos) and south (Cochiti) of the fire and not within the predominant wind direction. The latter areas were used as control (background) sites.

b. Sampling Procedures, Data Management, and Quality Assurance. Collection of samples for chemical analyses follows a set procedure to ensure proper collection, processing, submittal, and posting of analytical results. Stations and samples have unique identifiers to provide chain-of-custody control from the time of collection through analysis and reporting. The ESH-20 operating procedure (OP) entitled “Soil Sampling for the Soil Monitoring Program,” LANL-ESH-20-SF-OP-007, R0, 1997, contains all quality assurance/quality control (QA/QC) protocols, chemical analyses, data handling, validation, and tabulation information. An internal laboratory at LANL—the Inorganic Trace Analysis Group (CST-9)—analyzed most radionuclides and trace elements (light, heavy, and nonmetal), with the exception of strontium-90. Paragon Analytics of Fort Collins, CO, analyzed strontium-90 and all organic constituents. Both laboratories met all QA/QC requirements for analyzing the radionuclide and nonradionuclides of interest.

c. Radiochemical Analytical Results (On-Site, Perimeter, and Regional Background Soils). Table 6-1 shows data from soils collected in 2000. All radionuclide concentrations (activity) and radioactivity in soils collected from on-site and perimeter stations were low (e.g., in the pCi range), and most were nondetectable (i.e., the analytical result was lower than three times the counting uncertainty = 99% confidence level) (Corely et al., 1981) or within regional statistical reference levels (RSRLs). The RSRL (Purtymun et al., 1987) is the upper-level background concentration (mean plus two standard deviations = 95% confidence level) from data collected from regional background areas from 1995 through 1999 for worldwide fallout and natural sources of tritium; strontium-90; cesium-137; americium-241; plutonium-238; plutonium-239, -240; total uranium; and gross alpha, beta, and gamma radioactivity.

As a group (and using detectable and nondetectable values), the average concentrations of tritium and total uranium (and uranium isotopes) and gross gamma activity in soils collected from on-site or perimeter areas were significantly higher (95% confidence level) than concentrations in soils from regional background locations. Although the mean concentrations of these radionuclides were statistically higher than regional background, the differences in concentrations between the sites were very small. Also, mean concentrations of all radionuclides were far below LANL screening action levels (SALs) used to discern risk to humans. LANL SALs, developed by the Environmental Restoration (ER) Project at the Laboratory, identify the contaminants of concern on the basis of a 15-mrem/yr protective dose limit (ER 2001).

The slightly higher tritium activity in soils from on-site and perimeter areas as compared with regional background locations is probably due to Laboratory operations. We have observed higher amounts of tritium in soil samples collected from perimeter and especially from on-site areas when compared with regional background areas in past surveys, even though concentrations of tritium are still generally decreasing over time as average levels of tritium in 2000 are lower than in 1996 (Fresquez et al., 1998a). The higher levels of uranium detected in soil samples collected from on-site and perimeter areas, on the other hand, may be a result of either geologic or soil differences between the areas. Soils in the Los Alamos area, for example, are derived from Bandelier (volcanic) tuff and have higher-than-average natural uranium concentrations, ranging from 3 to 11 µg of uranium per gram of soil (Crowe et al., 1978). Uranium concentrations in soils collected from on-site and perimeter areas have generally been higher than in regional background soils (Fresquez and Gonzales 2000); the concentrations on LANL and perimeter lands, however, are not changing and are similar to past results (Fresquez et al., 1998a).

Table 6-2 shows the results of radionuclide concentrations in soils collected in 2000 after the fire and results of soils collected in 1999 before the fire. Because only one regional background site, Embudo, was predominantly downwind of the fire (Fresquez and Gonzales 2000), it was the only regional background station compared with pre-fire soil conditions. With the exception of the regional background station, we made statistical comparisons within LANL and perimeter sites and years (1999 versus 2000) using a nonparametric Wilcoxon Rank Sum test at the 0.05 probability level (Gilbert 1987). All mean radionuclide and radioactivity concentrations in soils collected from LANL and perimeter areas collected after the Cerro Grande fire were statistically similar to soils collected before the fire in 1999. Individual soil stations in LANL TAs most affected by the fire—TA-06, TA-15, and TA-16—contained radionuclides and radioactivity similar to concentrations in soils collected in 1999. Similarly, soils collected from the perimeter of LANL lands directly within the predominant path of the smoke plume (airport area, North Mesa area, Sportsman's Club area, and Tsankawi area) contained radionuclides and radioactivity similar to concentrations in soils collected in 1999. For a more detailed discussion of these data comparisons, see the report by Fresquez et al. (2000).

d. Radiochemical Analytical Results (Farm Soils). Table 6-3 presents the results of radionuclide concentrations in soils collected at selected (organic) farming communities downwind of the Cerro Grande fire. All of the radionuclides in soils collected from tilled gardens directly downwind of the Cerro Grande fire were either nondetectable, within activity levels in soils collected from farms not directly impacted by the fire (Cochiti and Pecos), or within the RSRL measured in regional soils (Cochiti, Jemez, Embudo) collected as part of the institutional surveillance program (Table 6-1). Only one radioactivity (screening) measurement out of 18 exceeded regional background concentrations. That measurement, gross gamma activity (5.5 [±0.6] pCi/g dry) from one soil/farm sample, was just above the regional background concentration of 4.1 pCi/g dry; that level, however, was still within the range of 8.5 pCi/g dry measured from regional background soils in past years (1995 through 1999). (Note: Gross gamma is a screening measurement, and it is the summation of all gammas recorded by an instrument.) Cesium-137, a gamma emitter, for this latter soil sample measured only 0.42 pCi/g dry and was within regional background concentrations, and a scan of the gamma spectroscopy output showed no other detectable man-made gamma emitters. Therefore, the slightly higher levels of gross gamma activity in this one soil sample compared with other regional background sites were probably due to naturally occurring gamma emitters. Results of the current survey are consistent with results of radionuclides and radioactivity in soils collected as part of the institutional soil surveillance program at LANL directly after the Cerro Grande fire (Table 6-1) and to the New Mexico Environmental Department results (Yanicak 2001a). For a more detailed discussion of these data, see Fresquez et al. (2001a).

e. Nonradiochemical Analytical Results (On-site, Perimeter, and Regional Background Soils). We analyzed soils for 22 light (barium, beryllium, titanium), heavy (silver, cadmium, cobalt, chromium, copper, mercury, molybdenum, nickel, lead, antimony, selenium, tin, thallium, vanadium, zinc), and nonmetal (arsenic, boron, selenium, cyanide) trace elements (occur at <1000 µg/g in soil) and three light (aluminum) and heavy (iron, manganese) abundant elements (occur at >1000 µg/g in soil). Table 6-4 contains the results of the 2000 soil-sampling survey. In general, nine out of the 25 elements measured in surface soils collected from regional background, perimeter, and on-site stations were below the limits of detection (LOD). Of those elements that were above the LOD in soils collected from perimeter and on-site areas, most were within RSRLs. The RSRLs were derived from regional background data averaged over eight years (1992–1999).

As a group, beryllium and lead concentrations in soils collected from perimeter and on-site areas were significantly higher ($\alpha = 0.05$) than lead and beryllium in soils from regional background locations. These results are similar to those reported in past surveys (Fresquez 1999; Fresquez and Gonzales 2000). All individual site and average lead and beryllium concentrations in soils from both on-site and perimeter areas were far below the SALs of 400 µg/g and

150 μg/g, respectively (EPA 2000). Like uranium, natural beryllium concentrations in the Los Alamos area are at higher-than-average levels. Ferenbaugh et al. (1990) and Longmire et al. (1995), for example, report that the range of naturally occurring beryllium in soils in the Los Alamos area is from 1.0 to 4.4 μg/g.

See Table 6-5 for the results of a comparison of trace elements before and after the fire. In addition, see Table 6-6 for many organic substances—volatile (VOC), semivolatile (SVOC), organochlorine pesticides (PEST), polychlorinated biphenyls (PCBs), high explosives (HE), and dioxin and dioxin-like compounds-assessed in soils from LANL, perimeter, and regional background locations after the fire. All mean trace elements in soils collected from perimeter and LANL areas after the Cerro Grande fire were statistically ($\alpha = 0.05$) similar to soils collected before the fire in 1999. Although the regional background site could not be statistically compared between years, all of the elements in soils collected after the fire were equal to concentrations in soils collected before the fire in 1999 and were well within the long-term background statistical range (Fresquez and Gonzales 2000). Also, cyanide, a compound ion of high concern because increased levels had been reported in storm water runoff after the fire (Gallaher 2000), appears to be similar at all three sites and is within background concentrations (1.0 μg/g) from other regional areas (Eisler 2000). Individual soil stations in LANL TAs most affected by the fire (TA-06, TA-15, and TA-16) and from the perimeter of LANL lands directly within the predominant path of the smoke plume (airport area, North Mesa area, Sportsman's Club area, and Tsankawi area) contained trace elements similar to concentrations in soils collected in 1999. For a more detailed discussion of these data comparisons, see Fresquez et al. (2000).

We did not detect organic compounds—VOC, SVOC, PEST, PCB, and HE—above reporting limits in any of the soils collected within or around LANL (Table 6-6). Nor did we detect dioxin (2,3,7,8-tetrachlorodibenzodioxin [TCDD]) in any of the soil samples analyzed. Of the other less toxic dioxin-like compounds analyzed, we detected 1,2,3,4,6,7,8,9-octachlorodibenzo-p-dioxin (OCDD) and, to a lesser extent, 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD) above reporting limits in most of the soil samples analyzed. These compounds, the least toxic of the six dioxin-like compounds analyzed, are by-products of natural (forest fires) and man-made (residential wood burning, municipal and industrial waste, etc.) sources. (Note: Recent studies show that dioxin emissions from forest fires could represent resuspended material from aerial deposits rather than originally formed material.) And, the highest amounts detected in the soil collected near the airport (3.7 parts per trillion [pg/g] of HpCDD, which is equal to 0 pg/g toxicity equivalents [TEQ], plus 29.1 pg/g of OCDD, which is equal to 0.029 pg/g TEQ, equals 0.029 pg/g total TEQ) were very far below the Agency for Toxic Substances and Disease Registry's soil screening level of 50 pg/g TEQs (ATSDR 1997). Because we detected OCDD upwind as well as downwind of the Cerro Grande fire (and LANL) (concentrations ranged from 9.9 to 22.4 pg/g) (Fresquez et al., 2001a), the OCDD was probably not related to the fire. (Note: The average soil concentration of dioxins in North America is 8.0 ± 6.0 pg/g TEQ, and uptake from water into food crops is insignificant because of the hydrophobic nature of these compounds [EPA 1994].) For a more detailed discussion concerning these data comparisons, see Fresquez et al. (2000).

f. Nonradiochemical Analytical Results (Farm Soils). Tables 6-7 and 6-8 show the results of trace elements and organic constituents in soils collected from selected (organic) farming communities downwind and upwind of the Cerro Grande fire. Four out of the 14 trace elements in all farm soils were below the LOD (Table 6-7). Of the 10 elements that were above the LOD in soils collected from farms predominantly downwind of the Cerro Grande fire, all, with the exception of slightly higher cadmium and selenium concentrations at one farm location, were within the concentrations detected in soils collected from farming areas not predominantly downwind of the fire (Cochiti and Pecos) and, for the most part, they were within trace element concentrations in soils collected as part of the environmental surveillance program (ESP) from regional areas (Table 6-4) and were within the lower range of elements normally encountered in soils within the continental United States (Bowen 1979).

We did not detect any PCBs, HEs, or polyaromatic hydrocarbons (PAHs) above reporting limits in any of the farm soil samples collected upwind or downwind of the Cerro Grande fire (Table 6-8). In addition, dioxin was not detected in any of the six farm soil samples. Of the other less toxic dioxin-like compounds analyzed, we detected only one, OCDD, and we detected it in all of the soils collected, including the two soil samples collected upwind of the fire. The highest amount of OCDD we detected in soils from the local farms (22.4 pg/g, which is equal to 0.022 pg/g

TEQ) was very far below the Agency for Toxic Substances and Disease Registry's soil screening level of 50 pg/g TEQs.

Of the 21 PEST compounds analyzed, we detected only trace amounts (in the parts per billion [ng/g] range) of 4,4-dichlorodiphenylethyene (4,4-DDE), a dichlorodiphenyltrichloroethane (DDT) breakdown product, above reporting limits in two out of the six farm soils; one out of the two farm soils included a sample collected from a farm upwind of the Cerro Grande fire (and LANL). (Note: DDT was banned in 1972, and although its derivatives remain in soil for many years, it is not readily taken up by most crop plants.) Because we detected no pesticides, including DDT-related compounds, in any of the soils (Table 6-6), surface ash plus soil, or ash (bark) (Gonzales and Fresquez 2000) collected within LANL lands after the fire, the source of 4,4-DDE in soils from these two farms was probably related to drift from the large-scale spraying operations the US Forest Service conducted on the Santa Fe National Forest in the 1960s (Brown et al., 1986). Small quantities of 4,4-DDE, for example, were detected in soils before the fire (Podolsky 2000) and in surface ash plus soil in samples collected after the fire (Gonzales and Fresquez 2000) on US Forest Service lands to the west (upwind and upslope) of LANL. In addition, 4,4-DDE was detected in fish collected in the Rio Grande upstream of LANL before the fire (Gonzales et al., 1999). For a more detailed discussion concerning the results of the soil samples collected from the farming areas, see Fresquez et al. (2001a).

g. Long-Term Trends. We performed a Mann-Kendal test for trend analysis on radionuclides and radioactivity in soils collected from on-site and perimeter stations from 1974 through 1996 (Fresquez et al., 1996a; Fresquez et al., 1998a). Although radionuclide and radioactivity levels were significantly higher in on-site (9 out of 10) and perimeter (4 out of 10, including plutonium-239, -240) soils when compared with regional background levels, most radionuclides, with the exception of plutonium-238 in soils from perimeter areas, exhibited significantly decreasing concentrations over time. The statistically significant (but very small) increase of plutonium-238 in perimeter soils over this interval may be related to the resuspension and redistribution of global fallout. Plutonium-238 and plutonium-239, -240 in soils from regional background areas also exhibited statistically increasing trends; however, the plutonium levels in regional background soils were still well within worldwide fallout concentrations.

The decreasing concentrations of the other isotopes in soils collected from on-site and perimeter areas over time may be a result of (1) cessation of aboveground nuclear weapons testing in the early 1960s, (2) weathering (water and wind erosion and leaching), (3) radioactive decay (half-life), and (4) reductions in operations or better engineering controls at LANL. Tritium, which has a half-life of about 12 years, exhibited the greatest decrease in activity over the 20-plus-year period of this study at all three areas: regional background, perimeter, and on-site. Indeed, by 1996, the majority of radionuclide and radioactivity values in soils collected from both perimeter and on-site areas were statistically similar to values detected in regional background locations. (Note: This trend analysis is the most current to date; however, concentrations of all radionuclides in soils collected from on-site and perimeter areas during the 2000 year, including tritium and uranium, were lower or similar to concentrations in 1996.)

Recently, these (long-term) data (1974 through 1999), particularly cesium-137 and plutonium-239, -240, were employed to determine the extent of LANL-added plutonium to the perimeter area environment. The ratio of cesium-137 to plutonium-239, -240 concentrations from worldwide fallout is about 33 (Hodge et al., 1996). Results (using median numbers) from data summarized over the 26-year-period show cesium-137/plutonium-239, -240 ratios ranging from 2 to 27 in on-site soils and from 5 to 37 in perimeter soils; regional background soils averaged 33, which compares well with cesium-137/plutonium-239, -240 ratios from other "background" areas. Maps of the ratios tend to show possible LANL-derived plutonium in a north to northeasterly direction generally concurrent with the major wind direction in the area. These interpretations are preliminary, and a more detailed study is currently underway that will, we hope, show the extent of LANL-derived plutonium with distance from the Laboratory.

3. Facility Monitoring

a. Area G. In 2000, we collected soil samples within and around the perimeter of Area G at TA-54-the Laboratory's primary low-level radioactive disposal facility (Figure 6-2). Collection of soil samples for chemical analyses follows a set procedure to ensure proper collection, processing, submittal, and posting of analytical results. Stations and samples have unique identifiers to provide chain-of-custody control from the time of collection through analysis and reporting. All QA/QC protocols, chemical analyses, data handling, validation, and tabulation can be found in the ESH-20 OP entitled "Sampling and Sample Processing for the Waste-Site Monitoring Program," LANL-ESH-20-SF-OP/HCP-011, 1999. Laboratory group CST-9 analyzed the soil samples for tritium; plutonium-238 and plutonium-239, -240; strontium-90; americium-241; cesium-137; and uranium, and all QA/QC requirements were met. Results are available in Table 6-9.

All of the radionuclide concentrations in soils collected within and around Area G were less than LANL screening action levels. Most of the values for soils were within the upper-level background concentrations except for tritium; plutonium-238 and plutonium-239, -240; and americium-241. The concentrations of plutonium-238 and plutonium-239,-240 in soils were largest in samples collected on the northern and eastern sides of Area G and were consistent with previous years (Nyhan et al., 2000).

b. DARHT. We completed a baseline report that lists the concentrations of radionuclides and trace elements in soils and sediments (and vegetation, small mammals, birds, and bees) around the DARHT facility during the construction phase (1996 through 1999) in 2000 (Nyhan et al., 2001a). The Mitigation Action Plan for the DARHT facility at LANL mandated establishing baseline concentrations for potential environmental contaminants before the start-up of the operational phase. These concentrations of radionuclides and trace elements now represent preoperational baseline statistical reference levels (BSRLs), which are calculated from the mean DARHT facility sample concentration plus two standard deviations.

In 2000, we collected soil and sediment samples during the operational phase within and around the DARHT facility (Figure 6-3). Collection, processing, and analysis of soil and sediment samples follow the protocols described in Section A.3.a. Tables 6-10 and 6-11 contain the results of radionuclides and trace elements. Results show that most radionuclides and trace elements in soil and sediment samples were below BSRLs (Fresquez et al., 2001b). Exceptions were concentrations of uranium; cesium-137; plutonium-238 and plutonium-239, -240; and americium-241 found in the soil and sediment samples collected at the east sample location, although a few other samples had slightly higher plutonium-238 and plutonium-239, -240 and lead concentrations than the BSRLs.

B. Foodstuffs Monitoring

1. Introduction

A wide variety of wild and domestic edible plant, fruit, and animal products are grown or harvested in the area surrounding the Laboratory. Ingestion of foodstuffs constitutes a critical pathway by which radionuclides can be transferred to humans (Whicker and Schultz 1982). For this reason, we collect samples of a wide host of foodstuffs (e.g., milk, eggs, produce [wild and domestic fruits, vegetables, and grains], fish, honey, herbal teas, mushrooms, piñon, domestic animals, and large and small game animals) on a systematic basis from Laboratory property and from the surrounding communities. DOE Orders 5400.1 and 5400.5 mandate this Foodstuffs Monitoring program.

The three main objectives of the program are to determine (1) radioactive and nonradioactive (light, heavy, and nonmetal trace elements) constituents in foodstuffs from on-site LANL, perimeter, and regional background areas; (2) trends; and (3) dose. Chapter 3 presents potential radiation doses to individuals from the ingestion of foodstuffs.

2. Produce

a. Monitoring Network. We collect fruits, vegetables, and grains each year from on-site, perimeter, and regional background locations (Figure 6-4). We also collect samples of produce from Cochiti and San Ildefonso Pueblos, which are located in the general vicinity of LANL. We compare produce from areas within and around the perimeter of LANL with produce collected from regional background gardens in northern New Mexico; these gardens are located in the Española, Santa Fe, and Jemez Pueblo areas. The regional sampling locations are far enough from the Laboratory that they are unaffected by Laboratory airborne emissions.

b. Sampling Procedures, Data Management, and Quality Assurance. We collect produce samples from local gardens within and around the perimeter of the Laboratory in the summer and fall of each year. (Note: All produce samples were collected after the Cerro Grande fire between the dates of June 22 and August 23, 2000.) All QA/QC protocols, chemical analyses, data handling, validation, and tabulation can be found in the ESH-20 OP entitled, "Produce Sampling and Processing for the Foodstuffs Monitoring Program," LANL-ESH-20-SF-OP-001, R0, 1997. During past years, Laboratory group CST-9 has analyzed produce for radionuclides and nonradionuclides.

This year, Paragon Analytics of Fort Collins, CO, analyzed produce samples. All QA/QC requirements for analyzing the radionuclides of interest were met.

c. Radiochemical Analytical Results. See Table 6-12 for concentrations of radionuclides in produce collected from on-site, perimeter, and regional background locations during the 2000 growing season. All radionuclide concentrations in fruits, vegetables, and grains collected from on-site, perimeter, and regional background areas were low, and most were nondetectable or within RSRLs.

As a group (and using detectable and nondetectable values), most radionuclides were not significantly higher ($\alpha = 0.05$) than produce collected from regional background locations. The only radionuclide in produce that was statistically higher between sites was tritium; concentrations of tritium were significantly higher in produce from Los Alamos, San Ildefonso/El Rancho, and on-site areas compared with regional background; however, the differences between the sites were small.

Last year (1999), concentrations of plutonium-238 were significantly ($\alpha = 0.05$) higher in produce from all of the perimeter areas compared with regional background. The source of the higher concentrations of plutonium-238 in produce from all of the perimeter areas was not completely known as all of the other radionuclides in produce from the perimeter areas collected last year were similar to background concentrations. This year (2000), concentrations of plutonium-238 in perimeter areas were similar to concentrations of plutonium-238 in produce collected from regional background areas, and the concentrations from all areas, including perimeter, were consistent with years before 1999.

See Table 6-13 for mean concentrations of radionuclides in produce collected from regional background, perimeter, and on-site areas before (1999) and after the fire (2000). In general, most radionuclides in produce at most sites collected after the Cerro Grande fire were statistically ($\alpha = 0.05$) similar to produce collected before the fire in 1999. Some radionuclides like cesium-137 and strontium-90 in produce collected at some sites, however, were higher in concentrations in 1999 than in 2000, and some radionuclides like tritium; plutonium-239, -240; and americium-241 in produce samples collected at some sites in 2000 were higher in concentrations than in 1999. Laboratory group CST-9 analyzed produce samples in 1999, whereas Paragon Analytics of Fort Collins, CO, analyzed produce samples collected in 2000. The differences in radionuclide concentrations—with the exception of tritium, which is probably related to the Laboratory—in produce collected in 1999 and 2000, therefore, are probably related more to differing analytical laboratory biases than to the effects of the Cerro Grande fire for the following reasons: (1) produce collected in 1999 had significantly higher concentrations of some radionuclides than produce collected in 2000, (2) produce collected upwind of the Cerro Grande fire (Cochiti/Peña Blanca/Sile) contained higher concentrations of plutonium-239, -240 and americium-241 than produce collected downwind of the fire (Los Alamos town site) [Note: The predominant wind direction during the Cerro Grande fire was to the northeast.], (3) americium and especially plutonium are not readily taken up by plants (Whicker and Schultz 1982), and (4) plutonium and americium in soils collected after the Cerro Grande fire in 2000 showed no significant increases compared with 1999 (Table 6-2). Additionally, most radionuclides, including americium and plutonium in produce collected from pueblo gardens, are similar to radionuclides in produce collected from these areas in years before 1999 (Fresquez et al., 1995).

d. Nonradiochemical Analytical Results. The trace elements silver, arsenic, beryllium, cadmium, chromium (for the most part), mercury, and thallium in produce from on-site, perimeter, and regional background locations were below the LOD (Table 6-14). These findings are not unexpected because metal uptake in plants is restricted in alkaline semiarid soil as a result of the formation of insoluble carbonate and phosphate complexes (Fresquez et al., 1991). In those cases where produce samples contained trace elements above the LOD (for barium, nickel, lead, selenium, and zinc), very few individual samples exceeded RSRLs. As a group, the levels of barium, nickel, lead, and zinc in produce from on-site and perimeter areas were not significantly higher ($\alpha = 0.05$) than in produce collected from regional background areas. Conversely, selenium concentrations in all perimeter and on-site stations were significantly higher than regional background concentrations. Although the concentrations of selenium in produce collected from perimeter and on-site stations were higher than regional background, the differences between the sites were low (e.g., a maximum difference of less than one µg/g). It should also be noted at this point that beryllium and lead, which were significantly higher in soils collected in perimeter and on-site areas, were not significantly higher in produce collected from perimeter or on-site areas compared with regional background.

Table 6-15 shows trace elements in produce collected before (1999) and after (2000) the Cerro Grande fire. With the exception of selenium, which was significantly higher in produce collected from all stations in 2000, none of the other concentrations of trace elements in produce collected after the Cerro Grande fire were significantly different from trace element concentrations in produce collected before the fire. It is hard to say that selenium in produce increased in concentration because of the Cerro Grande fire because (1) selenium in produce collected upwind of the fire (Cochiti/Peña Blanca) also showed statistical differences between the two years, (2) no other trace elements were elevated after the fire, and (3) selenium in soil samples collected from these same sites in 2000 was not significantly higher than selenium concentrations in soils collected in 1999 (Table 6-3). Instead, the statistically higher concentrations of selenium in produce collected in 2000 from most sites as compared with produce collected in 1999 may be a result of analytical laboratory bias.

3. Milk

a. Monitoring Network. We collected goat milk from Los Alamos and White Rock/Pajarito Acres and compared it with goat milk collected from a background dairy located near Albuquerque, NM. Albuquerque is located approximately 80 miles upwind of LANL. The samples were collected after the Cerro Grande fire.

b. Sampling Procedures, Data Management, and Quality Assurance. The farmer collected the milk and delivered it to our team. All QA/QC protocols, chemical analyses, data handling, validation, and tabulation can be found in the ESH-20 OP entitled, "Milk and Tea Sampling and Processing for the Foodstuffs Monitoring Program," LANL-ESH-20-SF-OP-005, R0, 1997. Laboratory group CST-9 analyzed the milk for radionuclides, and all QA/QC requirements were met.

c. Radiochemical Analytical Results. Table 6-16 presents the results of the radiochemical analysis performed on goat milk collected from the perimeter areas and Albuquerque in 2000. All radionuclide concentrations, including iodine-131, in goat milk from the perimeter areas were nondetectable or within upper-level background concentrations. Moreover, most radionuclides are lower than or similar to radionuclides in goat milk collected before the Cerro Grande fire in 1999 (Fresquez 1999; Fresquez and Gonzales 2000), and tritium and strontium-90 levels, in particular, are similar to tritium and strontium-90 levels in milk from other states around the country (Black et al., 1995).

4. Fish

a. Monitoring Network. We collect fish annually upstream and downstream of the Laboratory—mainly because 19 canyons cut through Laboratory property, and some flow resulting from excessive storm events may eventually reach the Rio Grande (Figure 6-4). This year, because of the Cerro Grande fire, we collected fish on three occasions—June, July, and August of 2000. Cochiti Reservoir, a 10,690-acre flood and sediment control project, is located on the Rio Grande approximately five miles downstream from the Laboratory. We compared radionuclides and nonradionuclides in fish collected from Cochiti Reservoir with fish collected from a background reservoir. The background reservoir, Abiquiu, is located on the Rio Chama, upstream from the confluence of the Rio Grande and intermittent streams that cross Laboratory lands (Fresquez et al., 1994).

The samples include two types of fish: game (predators) and nongame (bottom-feeders). This year, game fish include northern pike (*Esox lucius*), largemouth bass (*Micropterus salmoides salmoides*), smallmouth bass (*Micropterus dolomieui*), white crappie (*Pomoxis annularis*), and walleye (*Stizostedion vitreum*). Nongame fish include the white sucker (*Catostomus commersoni*), channel catfish (*Ictalurus punctatus*), carp (*Cyprinus carpio*), and carp sucker (*Carpiodes carpio carpio*). (Note: bottom-feeding fish are better indicators of environmental contamination than the predator game fish because they forage on the bottom where contaminants [e.g., radionuclides] readily bind to sediments [Whicker and Schultz 1982]).

b. Sampling Procedures, Data Management, and Quality Assurance. We collected fish by gill nets and transported them under ice to the laboratory for preparation. At the laboratory, fish were gutted, had their heads and tails removed, and were washed. We submitted muscle (plus associated bone) tissue for radiochemical analysis as an ash sample and submitted muscle (filet) in a wet frozen state for trace element analysis. All QA/QC protocols, chemical analyses, data handling, validation and tabulation can be found in the ESH-20 OP entitled, “Fish Sampling and Processing for the Foodstuffs Monitoring Program,” LANL-ESH-20-SF-OP-002, R0, 1997. Laboratory group CST-9 analyzed the fish samples, and all QA/QC requirements were met.

c. Radiochemical Analytical Results. Table 6-17 presents concentrations of radionuclides in game and nongame fish collected upstream and downstream of the Laboratory in June, July, and August of 2000 (after the fire). In general, all radionuclide concentrations in game and nongame fish collected from Cochiti Reservoir were low, and most were nondetectable or within upper-level background concentrations. These results were similar to radionuclide contents in crappie, trout, and salmon from comparable (background) reservoirs and lakes in Colorado (Whicker et al., 1972; Nelson and Whicker 1969) and New Mexico (Fresquez et al., 1996b; Fresquez et al., 1998c) and, more recently, in fish collected along the length of the Rio Grande from Colorado to Texas (Booher et al., 1998). Also, they compare well with fish collected in the Rio Grande below LANL in 1998 (Fresquez et al., 1999b).

As a group, both game and nongame fish collected downstream of LANL at Cochiti reservoir were not significantly higher ($\alpha = 0.05$) in most radionuclide concentrations (using detectable and nondetectable values) than were fish collected upstream of LANL at Abiquiu Reservoir. Strontium-90, cesium-137, and total uranium concentrations in game fish collected from Cochiti reservoir were significantly higher than fish collected from Abiquiu on the last sampling date (August). Only americium-241 concentrations in bottom-feeding fish from Cochiti on the last sampling date were significantly higher than background. The differences in these radionuclides in fish from Cochiti as compared with fish from Abiquiu, however, were low.

As expected, the nongame fish from both downstream and upstream reservoirs from LANL contained significantly higher average uranium contents (10 ng per dry gram) than the predators (4 ng per dry gram). The higher concentration of uranium in bottom-feeding fish compared with predator fish is attributed to the ingestion of sediments on the bottom of the lake (Gallegos et al., 1971). Radionuclides readily bind to sediments (Whicker and Schultz 1982).

Table 6-18 contains a comparison of radionuclide concentrations in fish collected before (1999) and after (2000) the Cerro Grande fire. Most mean radionuclide concentrations in fish collected after the Cerro Grande fire were statistically similar ($\alpha = 0.05$) to radionuclide concentrations in fish collected before the fire in 1999. In fact, fish collected in 1999 were higher in most mean radionuclide concentrations, particularly total uranium; plutonium-238 and plutonium-239, -240; and americium-241, than in fish collected after the fire.

d. Long-Term (Radionuclide) Trends. Fresquez et al. (1994) conducted a summary and trend analysis of radionuclides in game and nongame fish collected from reservoirs upstream (Abiquiu, Heron, and El Vado Reservoirs) and downstream (Cochiti Reservoir) of LANL from 1981 to 1993. In general, the average levels of strontium-90, cesium-137, plutonium-238, and plutonium-239, -240 in game and nongame fish collected from Cochiti Reservoir were not significantly different ($\alpha = 0.05$) from concentrations in fish collected from reservoirs upstream of the Laboratory. Total uranium was the only radionuclide that we found to be significantly higher in both game and nongame fish from Cochiti Reservoir when compared with fish from Abiquiu, Heron, and El Vado Reservoirs. Uranium concentrations in fish collected from Cochiti Reservoir, however, significantly decreased from 1981 to 1993, and fish samples collected from Cochiti Reservoir in 1993 showed no evidence of depleted uranium (DU) (Fresquez and Armstrong 1996). (Note: This trend analysis is the most current to date; however, concentrations of all radionuclides in fish collected downstream of LANL during the 2000 year were lower or similar to concentrations in 1993.)

e. Nonradiological Analytical Results. Total recoverable trace elements in the muscle (filet) of bottom-feeding fish collected upstream and downstream of LANL at three different sampling times after the Cerro Grande fire are available in Table 6-19. In general, many of the trace elements in fish collected upstream and downstream of LANL were below the LOD. Of those elements that were above the LOD, most, including mercury and cyanide, in fish collected from Cochiti reservoir were within RSRLs. All of the mean trace element concentrations in these fish on all three sampling dates were statistically similar ($\alpha = 0.05$) to fish collected upstream of LANL.

The results of the trace element analysis in fish samples from Cochiti and Abiquiu Reservoirs in past years showed that mercury was the only element to be detected above the LOD, and, this year as in past years, the concentrations of mercury in fish from Cochiti Reservoir were within the RSRL of 0.48 µg mercury per gram (wet weight basis) (Fresquez et al., 1999d). These data also compare well with bottom-feeding fish (split) samples the New Mexico Environment Department (NMED) collected from Cochiti in July; we show 0.20 µg mercury per gram in filet samples, and they show 0.30 µg mercury per gram in whole-gutted samples (wet weight basis) (Yanicak 2001b). Also, it should be noted at this point that total cyanide, a compound ion that was detected in elevated concentrations in storm water runoff as a result of the Cerro Grande fire (Gallaher 2000), was not significantly higher ($\alpha = 0.05$) in fish downstream of LANL compared with fish upstream of LANL.

See Table 6-20 for a comparison of bottom-feeding fish collected before (1999) and after (2000) the Cerro Grande fire. Most trace elements, including mercury, in bottom-feeding fish collected from Cochiti reservoir after the Cerro Grande fire were similar to fish collected from Cochiti reservoir before the fire. Only silver, barium, and cadmium concentrations in bottom-feeding fish collected from Cochiti reservoir in 2000 were significantly higher ($\alpha = 0.05$) than in fish collected in 1999. These same elements, for the most part, however, were significantly higher in fish collected from Abiquiu reservoir after the Cerro Grande fire than before the fire, and these elements were not statistically different in fish collected from Cochiti as compared with Abiquiu (Table 6-19). Therefore, the increase in these three elements in fish collected from Cochiti reservoir was probably not related to the fire.

f. Long-Term (Nonradiological) Trends. From 1991 to 1999, we conducted a summary and trend analysis of major trace elements, with special reference to mercury, in game and nongame fish collected from Abiquiu, Heron, and El Vado Reservoirs upstream of LANL (hereafter referred to collectively as Abiquiu) and Cochiti Reservoir downstream of LANL (Fresquez et al., 1999d). With the exception of mercury, most trace elements in fish collected from Abiquiu and Cochiti over a nine-year period were below the LOD. Mean mercury concentrations in all years in fish from Abiquiu, upstream of LANL, were generally higher than mercury concentrations in fish from Cochiti, and the statistical analysis of the mean of means showed that mercury in fish from Abiquiu was significantly higher ($\alpha = 0.10$) than mercury in fish collected from Cochiti. The highest individual mercury concentrations [1.0 µg/g wet weight] were detected in a single catfish each from Abiquiu and Cochiti in 1994, and the only carnivorous fish collected, brown trout from Abiquiu and white crappie from Cochiti in 1991, contained 0.30 and 0.36 µg/g of mercury (wet weight basis), respectively.

Mean concentrations of mercury in fish from both Abiquiu and Cochiti were within mercury concentrations typical of fish from nonpolluted fresh water systems (Abernathy and Cumbie 1977) and below the US Food and Drug Administration's ingestion limit of 1µg mercury/g wet weight (Torres 1998). Concentrations of mercury in catfish from this study were very similar to mercury levels in catfish recently collected from Conchas Lake, which averaged 0.25 µg/g wet weight, and Santa Rosa Lake, which ranged from 0.22 to 0.33 µg/g wet weight (Bousek 1996; Torres 1998). These authors concluded that the health risks that mercury in fish from Conchas and Santa Rosa Lakes poses to the average sport fisherman were negligible.

Overall, mean mercury concentrations in fish collected from both reservoirs show significantly decreasing trends over time; Abiquiu ($p = 0.045$) was significant at the 0.05 probability level, and Cochiti ($p = 0.066$) was significant at the 0.10 probability level. It is not completely known why concentrations of mercury are decreasing in fish collected from Abiquiu and Cochiti, but the reduction of emissions in coal-burning power plants or the reduction of carbon sources within the reservoirs may be part of the reason. Since the early 1980s, for example, coal-burning power plants in the northwest corner of New Mexico have been required to install venturi scrubbers and baghouses to capture particulates and reduce air emissions (Martinez 1999). Additionally, because the conversion of mercury to methyl mercury is primarily a biological process, it has been demonstrated that mercury concentrations in fish tissue rise significantly in impoundments that form behind new dams and then gradually decline to an equilibrium level as the carbon provided by flooded vegetation is depleted (NMED 1999). (Note: This trend analysis is the most current to date; however, concentrations of most trace elements, including mercury, in fish collected downstream of LANL during the 2000 year were similar to concentrations in 1999.)

5. Game Animals (Elk and Deer)

a. Monitoring Network. Mule deer (*Odocoileus hemionus*) and Rocky Mountain elk (*Cervus elaphus*) are common inhabitants of LANL lands. Resident populations of deer number from 50 to 100; elk number from 100 to 200 and increase to as many as 2,000 animals during the winter months (Fresquez et al., 1999c), reflecting large mammal migration to lower elevations. We collect samples of elk and deer as roadkills; therefore, the availability of samples is beyond our control, but usually the collection of one or two animals per year from Laboratory areas is possible. When an animal is collected, the muscle and bone are processed and analyzed for a host of radionuclides—the muscle because it is the major organ that humans consume and the bone because it may also be consumed, albeit indirectly, and many radionuclides like strontium and plutonium are deposited there. We then compare these data with meat and bone samples from elk and deer collected from regional background locations.

b. Sampling Procedures, Data Management, and Quality Assurance. We collected samples of elk and deer meat and bone tissue (1000 g each) from fresh roadkills around and within the Laboratory. The New Mexico Department of Game and Fish collected background samples. All QA/QC protocols, chemical analyses, data handling, validation, and tabulation can be found in the ESH-20 OP entitled, “Game Animal Sampling and Processing for the Foodstuffs Monitoring Program,” LANL-ESH-20-SF-OP-003, R0, 1997. Laboratory group CST-9 analyzed the samples. We collected the samples reported here in 1999. (Note: These data were received late, so we could not report the results in the 1999 ESR; they are reported here, however, for completeness.)

c. Radiochemical Analytical Results. All radionuclide concentrations in meat and bone tissue of a bull elk collected from LANL lands within TA-16, a TA where environmental testing of high explosives occurs, were nondetectable or below upper-level background concentrations (Table 6-21) and were within concentrations from past years (Fresquez et al., 1998b).

Most radionuclide concentrations in meat and bone tissue of a deer collected from LANL lands at TA-49, a TA where high explosives and radioactive experiments occurred in past years, were nondetectable or within RSRLs (Table 6-22) and were within concentrations from past years (Fresquez et al., 1998b). Strontium-90 was the only radionuclide in bone of the deer collected from LANL lands that was higher than regional background concentrations. The differences in concentrations between the deer collected from the two areas, however, were low.

d. Long-Term Trends. A 1998 report summarized radionuclide concentrations (tritium, strontium-90; cesium-137; plutonium-238 and plutonium-239, -240; americium-241; and uranium) determined in meat and bone tissue of deer and elk collected from LANL lands from 1991 through 1998 (Fresquez et al., 1998b). Also, we estimated the CEDE to people who ingest meat and bone from deer and elk collected from LANL lands. Most radionuclide concentrations in meat and bone from individual deer and elk collected from LANL lands were at less than detectable quantities or within upper-level background concentrations. As a group, most radionuclides in meat and bone of deer and elk from LANL lands were not significantly higher ($\alpha = 0.10$; at the 90% confidence level) than in similar tissues from deer and elk collected from regional background locations (using detectable and nondetectable values). Also, elk that had been tracked for two years with radio collars and spent an average time of 50% on LANL lands were not significantly different in most radionuclide levels from roadkill elk that have been collected on LANL lands as part of the ESP. All CEDEs were far below the International Commission on Radiological Protection guideline of 100 mrem/yr. (Note: This trend analysis is the most current to date; however, concentrations of all radionuclides in elk and deer collected from LANL lands during 1999 were lower or similar to concentrations in 1998.)

6. Honey

a. Monitoring Network. We sampled honey bee (*Apis mellifera ligustica*) hives located within perimeter areas—Los Alamos town site and White Rock/ Pajarito Acres. We compared honey from those hives with honey collected from regional background hives located in Jemez and Española, New Mexico. These samples were collected after the Cerro Grande fire.

b. Sampling Procedures, Data Management, and Quality Assurance. We collected honey directly from the producer in their bottles. All QA/QC protocols, chemical analyses, data handling, validation and tabulation can be found in the ESH-20 OP entitled, “Honey Sampling and Processing for the Foodstuffs Monitoring Program,” LANL-ESH-20-SF-OP-004, RO, 1997. Laboratory group CST-9 analyzed the samples, and all QA/QC requirements were met.

c. Radiochemical Analytical Results. See Table 6-23 for the analytical results of the honey collected during 1999 and 2000. The honey sample collected in 1999 from the Los Alamos town site hive was lost in analysis during the tritium distillation process (Fresquez and Gonzales 2000). Consequently, we obtained another sample from the same hive and time period for a reanalysis of selected radionuclides and are reporting the results here. These results showed that all radionuclides analyzed were nondetectable or within upper-level background concentrations and were in concentrations similar to past years (Fresquez et al., 1997a; Fresquez et al., 1997b).

For the year 2000 samples, which we collected after the Cerro Grande fire, results show that all radionuclides in honey collected from the perimeter and regional background hives were at nondetectable levels or within upper-level background concentrations and were in concentrations similar to past years (Fresquez et al., 1997a; Fresquez et al., 1997b; Fresquez and Gonzales 2000).

d. Long-Term Trends. Several recent long-term data evaluations have examined radionuclide concentrations, particularly tritium, in bees and honey within the LANL environs. The first study evaluated a host of radionuclides (tritium; cobalt-57; cobalt-60; europium-152; potassium-40; beryllium-7; sodium-22; manganese-54; rubidium-83; cesium-137; plutonium-238 and plutonium-239, -240; strontium-90; americium-241; and total uranium) in honey collected from hives located around the perimeter of LANL (Los Alamos and White Rock/Pajarito Acres) over a 17-year period (Fresquez et al., 1997a). All radionuclides, with the exception of tritium, in honey collected from perimeter hives around LANL were not significantly different (a = 0.05) from background. Overall, the maximum total net positive CEDE—based on the average concentration plus two standard deviations of all the radionuclides measured over the years after the subtraction of background—from consuming 11 lb. of honey (maximum consumption rate) collected from Los Alamos and White Rock/Pajarito Acres was 0.031 mrem/yr and 0.006 mrem/yr, respectively. The highest CEDE was <0.04% of the International Commission on Radiological Protection permissible dose limit of 100 mrem/yr from all pathways. (Note: This trend analysis is the most current to date; however, concentrations of all radionuclides in honey collected from perimeter locations during the 2000 year were lower or similar to concentrations in 1997.)

The second study examined tritium concentrations in bees and honey collected from within and around LANL over an 18-year period (Fresquez et al., 1997b). Based on the long-term average, bees from nine out of 11 hives and honey from six out of 11 hives on LANL lands contained tritium that was significantly higher ($\alpha = 0.05$) than regional background. The bees with the highest average concentration of tritium (435 pCi/mL) collected over the years were from LANL's low-level radioactive waste disposal site (Area G) at TA-54. Similarly, the honey with the highest average concentration of tritium (709 pCi/mL) came from a hive located near three tritium-contaminated storage ponds at LANL TA-53. The average concentrations of tritium in bees and honey from background hives were 1.0 pCi/mL and 1.5 pCi/mL, respectively. Although the concentrations of tritium in bees and honey from most LANL and perimeter (White Rock/Pajarito Acres) areas were significantly higher than regional background, most areas, with the exception of TA-53 and TA-54, generally exhibited decreasing tritium concentrations over time. (Note: This trend analysis is the most current to date; however, concentrations of tritium in honey collected from perimeter and LANL lands in 2000 were lower or similar to concentrations in 1997.)

7. Special Foodstuffs Monitoring Studies

a. Prickly Pear. We collected prickly pear (fruit) (*Opuntia phaecantha*) from LANL and three perimeter areas in 1999: Los Alamos town site on the north, White Rock/Pajarito Acres on the southeast, and Pueblo of San Ildefonso lands on the east. (Note: These data were received late, so we could not report the results in the 1999 ESR; they are reported here, however, for completeness.) We also collected fruit from prickly pear in the Española/Santa Fe/Jemez area as a background comparison. The regional sampling locations were far enough from the Laboratory that they were mostly unaffected by Laboratory airborne emissions. All QA/QC protocols, chemical analyses, data handling, validation, and tabulation can be found in the ESH-20 OP entitled, "Produce Sampling and Processing for the Foodstuffs Monitoring Program," LANL-ESH-20-SF-OP-001, R0, 1997. Laboratory group CST-9 analyzed the samples, and all QA/QC requirements were met.

Tables 6-24 and 6-25 present the radionuclide and trace element results of the prickly pear collected during 1999. All radionuclides, with the exception of strontium-90, in prickly pear fruit collected from perimeter areas were in nondetectable quantities or within RSRLs. Although strontium-90 in prickly pear fruit collected from two of the perimeter areas—San Ildefonso and Los Alamos town site—was higher than regional background, the differences between the two general sites were low. Uranium concentrations tended to also be higher in prickly pear fruit collected from the perimeter areas as compared with regional background; however, the concentrations of uranium in the perimeter areas were similar to produce samples collected from past years.

Of the 12 trace elements in prickly pear fruit collected from the perimeter areas, only four (barium, copper, nickel, and lead) were above the LOD (Table 6-25). And, of these four elements, only barium and possibly copper appeared to be in higher concentrations than regional background concentrations. It is not known exactly why barium concentrations in prickly pear fruit from the perimeter area were relatively higher than in regional background fruit, as the concentrations of barium in soils from perimeter locations in past years were not significantly higher than regional background soils (Fresquez 1999). Although this may be due to other agronomic factors, we will repeat the study this coming season and reappraise the results with special reference to barium.

b. Herbal Teas. We collected two types of herbal teas—Saint John's Wort (*Hypericum perforatum*) and Elderberry (*Sambucus canadensis*)—from the La Puebla area just north east of Española at the request of the producer who had concerns about the effect of large amounts of smoke and fallout ash from the Cerro Grande fire on these products. In past years, we have collected Navajo Tea, another popular local tea, and the herbal teas we collected this year were processed in the same manner. In general, we added tap water to a defined quantity of the vegetative (unwashed) portion of each tea variety and brought the mixture to a boil. After the tea was cooled, it was filtered and poured into a suitable container and submitted to chemistry as a liquid. All QA/QC protocols, chemical analyses, and data handling, validation, and tabulation can be found in the ESH-20 OP entitled, "Milk and Tea Sampling and Processing for the Foodstuffs Monitoring Program," LANL-ESH-20-SF-OP-005, R0, 1997. Laboratory group CST-9 analyzed the samples, and all QA/QC requirements were met.

Table 6-26 contains the results of radionuclides in Saint John's Wort and Elderberry tea collected from regional background areas after the Cerro Grande fire. All of the radionuclides analyzed were nondetectable and, with the exception of tritium, were within radionuclide concentrations in Navajo Tea collected from regional background areas in past years (Fresquez and Gonzales 2000). Reported values for tritium were larger in the 2000 samples than for previous samples of Navajo Tea, but the measurement uncertainties were too large for these values to be considered detectable.

C. Biota Monitoring

1. Introduction

In addition to monitoring human foodstuffs for contaminants, DOE Orders 5400.1 and 5400.5 mandate the monitoring of nonfoodstuffs biota for the protection of ecosystems (DOE 1991). Although monitoring of biota mostly in the form of facility-specific or site-specific studies began in the 1970s with the ESP, in 1994 the DOE requested additional emphasis on nonfoodstuffs biota. Nonfoodstuffs biota, such as small mammals, amphibians, birds, and vegetation, are monitored within and around LANL on a systematic or special study basis for radiological and nonradiological constituents. We also monitor or study some human foodstuffs that serve as an important link in ecological foodchains, such as fish consumed by bald eagles. We are currently emphasizing organic chemical analysis because research has determined that the highest risk to nonhuman biota at the Laboratory is generally not from radionuclides but rather from organic compounds such as pesticides and PCBs (Gonzales 2000).

Last year, we reported on vegetation that was systematically collected at the 25 traditional soil sampling stations within and around LANL (Fresquez and Gonzales 2000). Vegetation is one of the media that we will periodically sample as part of the routine surveillance program because it is the foundation of ecosystems as it provides a usable form of energy and nutrients that are transferred through food chains. Because of this function in the food chain, vegetation can serve as an important pathway of contaminants to biological systems. Fish and small mammals are also on the routine surveillance list. As reported below, we sampled fish in the year 2000 at Cochiti Reservoir, which is down-channel of LANL, and analyzed them for organic contaminants. We have sampled small mammals in special monitoring studies but never on a

Laboratory-wide, routine basis. This section will also summarize an ecological risk assessment that was conducted at LANL in the year 2000. Ecological risk assessment is becoming an important tool at LANL and other DOE sites because it helps risk managers identify locations where field studies are needed. Site-specific special monitoring studies, also discussed in this chapter, are important in establishing site-specific coefficients of contaminant transfer between different feeding levels so that accurate dose estimates can be made (Whicker and Schultz 1982; Calabrese and Baldwin 1993; EPA 1998).

The two main historical objectives of the biota program are to determine (1) on-site and perimeter contaminant concentrations in biota and compare them with off-site regional background concentrations and (2) trends over time. With the issuance of the interim standard on evaluating radiation doses to aquatic and terrestrial biota that resulted from anthropogenic sources at DOE sites as reported in Chapter 3 (DOE 2000), a new and third objective is providing data for use in evaluating compliance with specified limits on radiation dose to plants and animals. The standard will be implemented incrementally over time.

2. Institutional Surveillance of Fish

a. Monitoring Network. As discussed in Section 6.B.4, we sample and analyze fish from bodies of water that are adjacent to or potentially influenced by LANL as part of the routine surveillance program. In calendar year 2000, we sampled Cochiti and Abiquiu (background site) reservoirs. We analyzed carp and carp sucker whole-body samples for PCBs and organochlorine pesticides.

b. Sampling Procedures, Data Management, and Quality Assurance. The sampling procedure, data management, and quality assurance were generally the same as described in Section 6.B.4.b. Whole-body (head, tail, skin, viscera, bone, and muscle) fresh weight (FW) samples were homogenized and analyzed using a modified Environmental Protection Agency Method 1668—high-resolution gas chromatography and high-resolution mass spectrometry (HRGC/HRMS). The organochlorine pesticides were hexachlorobenzene; alpha, beta, and gamma hexachlorohexane; heptachlor, aldrin, oxychlordane, trans-chlordane, cis-chlordane, dichlorodiphenyltrichloroethane (DDT); dichlorodiphenyldichloroethane (DDD); dichlorodiphenylethane (DDE); trans-nonachlor, cis-nonachlor, mirex, alpha-endosulfan (I); dieldrin, endrin, beta-endosulfan (II); endosulfan sulfate; methoxychlor; delta HCH; and heptachlor epoxide. Theoretically, PCBs have 209 different possible congeners, but only about 130 have ever been detected, and the majority of the toxicity exhibited by PCBs is from the group of 13 coplanar PCBs that behave like dioxins (“dioxin-like PCBs”). We analyzed the fish for the 13 dioxin-like PCBs: PCB No. 77 (3,3',4,4'-TeCB), 81 (3,4,4',5-TeCB), 105 (2,3,3',4,4'-PeCB), 114 (2,3,4,4',5-PeCB), 118 (2,3',4,4',5-PeCB), 123 (2',3,4,4',5-PeCB), 126 (3,3',4,4',5-PeCB), 156 (2,3,3',4,4',5-HxCB), 167 (2,3',4,4',5,5'-HxCB), 169 (3,3',4,4',5,5'-HxCB), 170 (2,2',3,3',4,4',5-HpCB), 180 (2,2',3,4,4',5,5'-HpCB), and 189 (2,3,3',4,4',5,5'-HpCB).

Detection limits ranged from 0.01–10 pg/g (parts per trillion [ppt]) for the PCB congeners and 0.01-0.5 ng/g (parts per billion [ppb]) for the pesticides. Measured levels were generally two to four orders of magnitude above the detection limits. Axys, Inc., documented the specifics of the analytical method in a statement of qualification (1999).

To assess the toxicity of PCBs, we computed one other parameter—TEQ values—as follows. Some structurally related aromatic hydrocarbons, such as the 13 dioxin-like PCBs and dioxins, invoke a number of common toxic responses. The relative toxicity or potency of the 13 dioxin-like PCBs in comparison with the toxicity of tetrachlorodibenzodioxin (TCDD) is known. On this basis, the World Health Organization has developed TCDD equivalency factors (TEFs) for the 13 congeners and a method by which their toxicity can be assessed. To evaluate the dioxin-like toxicity PCBs cause, the concentration of each congener in biological tissue is multiplied by the TEF, and the 13 resulting values are summed, resulting in a TEQ. The TEQ can then be used in a number of ways such as comparing it with a screening value or other benchmarks for TCDD.

c. Analytical Results (PCBs and TEQs). Table 6-27 shows the congener analytical results, TEQs, and totals. With very low detection limits (ppt), we detected PCBs in all 18 samples (13 Cochiti and 5 Abiquiu). Total dioxin-like PCBs ranged from 5.9E-04 to 1.6E-03 parts per million (ppm)-FW in Abiquiu reservoir and from 1.5E-03 to 2.8E-02 ppm-FW in Cochiti. Mean total PCB levels in Cochiti were 1.5E-02 (June), 4.2E-03 (July), and 5.2E-03 (August) ppm-FW. The national mean concentration of total PCBs in whole fish in 1984 was 0.39 ppm (EPA 1999). The mean total PCB concentration for Abiquiu was 1.1E-03 ppm-FW. The five Abiquiu values were fairly tightly grouped as shown by a standard deviation of 32% of the mean. July values at Cochiti were also fairly tightly (56%) grouped, and June and August samples exhibited high variation.

To determine whether data from both species of fish could be combined within each location to statistically compare Cochiti to Abiquiu, we statistically analyzed species effect using the Cochiti data. Species differences were nonsignificant (P = 0.12, $t_{0.05,4,7}$ = 2.8). The effect of time for the Cochiti samples was also nonsignificant (P = 0.15, $F_{0.05,2,10}$ = 2.3). The mean PCB concentration at Cochiti (7.1E-03 ppm) was about seven times higher than the Abiquiu reference site mean concentration (1.1E-03 ppm), and these differences were statistically significant (P = 0.02; $t_{0.05,13,5}$ = 2.7). PCB distribution is known to be worldwide (Stoker and Seager 1976; EPA 1999), and sources into the Rio Grande up-river from LANL are possible. The contribution of PCBs into Cochiti Reservoir from LANL operations cannot be discerned from data only on these reservoirs. Long-term sampling of the Rio Grande, such as done in 1997 (Gonzales et al., 1999), is also needed to discern the LANL contribution.

The mean total PCB concentration at Cochiti was about four times higher than the mean plus two standard deviations for Abiquiu. Although the PCB concentrations at Cochiti generally showed a slight decreasing trend over the three-month time period (Figure 6-5), the variation within each sampling time is too great to imply any Cerro Grande fire-related short-term trend on a statistical basis for the three months sampled.

The net (Cochiti minus Abiquiu) mean total PCB concentration was 6.0 μg/kg (0.006 ppm), and the net maximum total PCB concentration was 26.0 μg/kg (0.026 ppm). Eisler and Belisle (1996) recommend a whole-body total PCB concentration of <400 μg/kg FW for the protection of fish. Niimi (1996) cites concentrations of >50 ppm as necessary to affect reproduction or growth and concludes that concentrations in the high ppb to low ppm can cause cellular or biochemical changes but also notes that the ecotoxicological significance of these changes is largely unknown. Barron et al. (1995) cites a dietary no-observable-adverse-effects-concentration (NOAEC) of 0.5 ppm in the American kestrel.

TEQs ranged from 1.5E-07 to 6.3E-06 ppm. The net (Abiquiu minus Cochiti) mean total TEQ was 2.5E-06 ppm, and the net maximum total TEQ was 3.7E-06 ppm. Giesy and Kurunthachalam (1998) cite a NOAEC of 3.0E-07 ppm for the protection of mink. Mink are known to be extremely sensitive to PCBs.

The PCB concentrations measured in this study are not suitable for comparison with human risk screening values because they include contribution by tissue (e.g., bone) and media (e.g., sediment in the stomach) not normally consumed by humans.

d. Analytical Results (Pesticides). Table 6-28 shows the analytical results for the pesticides. With very low detection limits (<ppb), we detected DDT, DDD, and DDE in all 18 samples (13 Cochiti and 5 Abiquiu). DDT concentrations ranged from 3.4E-04 to 2.6E-03 ppm-FW in Abiquiu fish and from 8.9E-04 to 4.2E-03 ppm-FW in Cochiti fish. The mean DDT concentration in Cochiti fish was 2.8E-03 ppm compared with the mean DDT concentration in Abiquiu fish of 1.3E-03 ppm. The mean DDE concentration in Cochiti fish was 5.5E-02 ppm-FW compared with the mean DDE concentration in Abiquiu fish of 2.0 E-02 ppm-FW. Both concentrations are below a 1990 national geometric mean concentration of 1.9E-01 ppm-FW (Schmitt et al., 1990) and are within the range (0.02–0.08 ppm) in whole-body concentration measured by Carter (1997) in the common carp in the Rio Grande at three locations below Cochiti Reservoir in 1992–1993. In our study, the mean whole-body DDE concentration in the common carp, 0.085 ppm (n = 5), compares with the mean muscle (fillet) concentration of 0.096 ppm (n = 8) that we measured in common carp sampled from the Rio Grande in 1997 (Gonzales et al., 1999).

As with PCBs, to determine whether data from both species of fish could be combined within each location to statistically compare Cochiti fish to Abiquiu fish, we statistically analyzed species effect for DDT and DDE using the Cochiti data. Species differences were nonsignificant (DDT: P = 0.62, $t_{0.05,4,7}$ = -0.5; DDE: P = 0.09, $t_{0.05,4,7}$ = 2.1). The mean DDT and DDE concentrations at Cochiti were significantly (DDT: P = 0.029, $t_{0.05,13,5}$ = 2.7; DDE: P = 0.01, $t_{0.05,13,5}$ = 2.9) higher than the respective mean DDT and DDE concentrations at Abiquiu. Cochiti Reservoir is the first reservoir on the Rio Grande from its origin in Colorado. The distribution of DDT and its metabolites are known to be worldwide (Stoker and Seager 1976), and sources into the Rio Grande up-river from LANL are known to exist because they have been detected (Carter 1997). The contribution, if any, of DDT and its metabolites into Cochiti Reservoir from LANL operations cannot be discerned from data only on these reservoirs. Long-term sampling of the Rio Grande, such as the sampling that we did in 1997 (Gonzales et al., 1999), is also needed to discern the LANL contribution. DDT and DDE have been detected in fish at up-river locations in New Mexico and Colorado (Carter 1997) and more locally at locations just above and below LANL at higher concentrations than at LANL confluence's with the Rio Grande (Gonzales et al., 1999). A previous study identified an aerial application of a high concentration of DDT in 1963 (Gonzales et al., 1999); however, isolated use of DDT in the Rito de los Frijoles watershed is also documented (Allen 1989). Localized use of DDT was common in the 1960s and early 1970s. The net (Abiquiu minus Cochiti) mean DDE concentration was 0.035 µg/g (ppm), and the net maximum DDE concentration was 0.11 µg/g (ppm). The effects of DDT and its metabolites on eggshell thinning, one of the most sensitive endpoints, are well documented. Studies indicate that a piscivore's diet averaging 1.0 ppm DDE or more can cause eggshell thinning.

The pesticide concentrations measured in this study are not suitable for comparison with human risk screening values because they include contribution by tissue (e.g., bone) and media (e.g., sediment in the stomach) not normally consumed by humans.

3. Facility Monitoring

a. Area G.

Vegetation. We did not collect vegetation samples at Area G in 2000. The last vegetation samples were collected in 1999 and are reported here for completeness. In general, we collected unwashed overstory and understory vegetation samples at 12 locations within and around Area G (Figure 6-2). Collection of vegetation samples for chemical analyses follows a set procedure to ensure proper collection, processing, submittal, and posting of analytical results. Stations and samples have unique identifiers to provide chain-of-custody control from the time of collection through analysis and reporting. All QA/QC protocols, chemical analyses, data handling, validation, and tabulation can be found in the ESH-20 OP entitled "Sampling and Sample Processing for the Waste-Site Monitoring Program," LANL-ESH-20-SF-OP/HCP-011, 1999. Laboratory group CST-9 analyzed the vegetation samples for tritium; plutonium-238 and plutonium-239, -240; strontium-90; americium-241; cesium-137; and uranium, and all QA/QC requirements were met.

Results showed that most of the radionuclide concentrations in the unwashed vegetation samples collected in 1999 were below upper-level background concentrations, except for tritium (data not given but can be found in Nyhan et al., 2000). Tritium concentrations in vegetation from most sites were greater than background concentrations of about 2 pCi/mL.

Bees. We did not collect honey bee samples in 2000 at Area G. The last bee samples were collected at Area G in 1999 and are reported here for completeness. In general, two colonies were established on the south end of Area G near the tritium shafts. We brought these colonies into the study site from a background area. In addition, a control (regional background) site with one colony was established 10 km (6 mi.) south of Jemez Springs, NM. In the early fall 1999, we collected bee tissue samples from all of the colonies. Each of the three separate 100-g samples (one from each colony) consisted of approximately 1,000 bees. We used a small, rechargeable vacuum to collect the bee samples. Bees were vacuumed off frames that were removed from the hive, transferred to a plastic resealable bag, weighed, and double bagged into plastic resealable bags. We kept all samples in a cooler and froze them upon returning to the laboratory. After collecting each sample, we thoroughly cleaned the vacuum collection area to avoid cross-contamination of samples. All samples were analyzed for tritium; strontium-90; cesium-137; americium-241; plutonium-238; plutonium-239, -240; and total uranium; see Fresquez et al. (1997a) for a description of the methods. All QA/QC protocols, chemical analyses, data handling, validation, and tabulation can be found in the ESH-20 OP entitled, "Managing Bee Colonies," LANL-ESH-20-BIO-OP-024, RO, 1997. Laboratory group CST-9 analyzed the bee samples, and all QA/QC requirements were met.

In general, most radionuclides, with the exception of tritium, strontium-90, and total uranium, were within RSRLs (data not given but can be found in Haarmann and Fresquez 2000). The RSRL is the upper-level background concentration derived from the combined 1997, 1998, and 1999 control data (Haarmann and Fresquez 1998, 1999). Similar to our results from 1997 and 1998, the largest concentration difference between Area G and the RSRL was in the tritium levels. Tritium levels in the Area G bees, for example, were at 146.9 and 122.0 pCi/mL; the control colony contained –0.10 pCi/mL, with a RSRL of 5.5 pCi/mL. Concentrations of strontium-90 were higher in one Area G colony than the RSRL. Additionally, concentrations of total uranium were higher than the RSRL in the other Area G colony.

b. DARHT.

Vegetation. We completed baseline concentrations of radionuclides and trace elements in vegetation (and soils, sediments, small mammals, birds, and bees) around the DARHT facility during the construction phase (1996 through 1999) in 2000 (Nyhan et al., 2001a). The Mitigation Action Plan for the DARHT facility at LANL mandated the establishment of baseline concentrations for potential environmental contaminants. These concentrations of radionuclides and trace elements now represent preoperational baseline statistical reference levels (BSRLs), which are calculated from the mean DARHT facility sample concentration plus two standard deviations.

In 2000, we collected unwashed overstory and understory vegetation samples during the operational phase within and around the DARHT facility. Collection, processing, submittal, and analysis of vegetation samples follow a set procedure described in Section C.3.a.i. Tables 6-29 and 6-30 present the results of radionuclides and trace elements, respectively. See Figure 6-3 for the locations of sampling points.

None of the radionuclide concentrations found in overstory and understory vegetation samples were above BSRLs (Fresquez et al., 2001b), except for the concentration of plutonium-239, -240 found in the overstory sample collected at the north sampling location. Even this sample was not significantly different than the BSRL concentration because it was within one standard deviation of the BSRL concentration. Table 6-30 shows that the trace element concentrations in many samples were less than regional background concentrations and BSRL concentrations, but three sets of values exceeded BSRL concentrations. One set had detection limits that were greater than BSRL values, thus these values could not be realistically compared with BSRL values. Examples from Table 6-30 are results for silver, arsenic, beryllium, cadmium, nickel, antimony, selenium, and thallium. A second set had values found to have a strong positive bias resulting from analytical problems, so we did not use them in these calculations. Examples from Table 6-30 are arsenic and selenium; this positive bias also meant that these values could not be realistically compared with BSRL values. The third set of values was legitimately greater than BSRL values. The concentration of copper in the overstory sample from the north location was greater than BSRL values, and all of the other vegetation samples were greater than the regional background concentrations for copper. The lead concentration in all understory samples was greater than regional background, and the sample from the west location was greater than the BSRL as well. In contrast, the concentration of lead from the overstory samples was less than regional background in all but the sample from the south location, and none of the overstory samples exceeded the BSRLs.

Bees. We sampled honey bees around the DARHT facility in 2000; however, the data are not yet available. Instead, we are reporting data from 1999, which was the third year of gaining baseline concentrations for a variety of radionuclides in bees. We collected bee samples from five colonies, established at the DARHT site approximately 100 m northwest of the DARHT facility. These samples were collected, processed, and analyzed for the constituents described in Section C.3.a.

Results show that one of the honey bee samples was higher than the RSRL for cesium-137, plutonium-238, and americium-241 (data not given but can be found in Haarmann 2001). Three of the honey bee samples were higher than the RSRL for plutonium-239, -240, and all five samples were higher than the RSRL for total uranium, silver, barium, lead, arsenic, and selenium.

4. Special Biological Monitoring Studies

a. Radionuclides and Nonradionuclides in Meat and Bone of a Raccoon Near Area G. We collected a raccoon (*Procyon lotor*) killed by an automobile near Area G at TA-54 and analyzed the meat (muscle) and bone for tritium; strontium-90; cesium-137; americium-241; plutonium-238; plutonium-239, -240; and total uranium. We compared these data from meat and bone samples with radionuclide concentration in meat and bone samples from a “background” raccoon killed on a roadway on the northern portion of the Los Alamos town site. The raccoons were collected during 1999, but because the analysis was not completed in time for publication in the 1999 ESR, we are presenting the data here. All QA/QC protocols, chemical analyses, data handling, validation, and tabulation can be found in the ESH-20 OP entitled, “Game Animal Sampling and Processing for the Foodstuffs Monitoring Program,” LANL-ESH-20-SF-OP-003, R0, 1997. Laboratory group CST-9 analyzed the raccoon samples, and all QA/QC requirements were met.

See Table 6-31 for the radionuclide results of the meat and bone tissue of the raccoon collected from the TA-54 area. Plutonium-238, cesium-137, and especially tritium in meat of the raccoon collected at TA-54 were higher than the RSRL. Tritium in bone samples of the same raccoon was also elevated above background concentrations. All other radionuclides in meat and bone tissue of the raccoon collected at TA-54 were nondetectable or within RSRLs. Other media collected at TA-54 near Area G have been higher in tritium concentrations in past years: soils and vegetation (Fresquez et al., 1999a; Nyhan et al., 2000), field mice (Biggs et al., 1997; Bennett et al., 1998), pocket gophers (Gonzales et al., 2000b), and bees (Haarmann and Fresquez 1998, 1999, and 2000) are examples.

b. Biological Resources Management Plan Special Study: Organic Biocontaminants in Food Chains at Two Canyons at the Los Alamos National Laboratory. We conducted a range-finding study in DP and Sandia canyons to establish the upper range of PCBs, DDE, and other organic contaminants in biological organisms at LANL. We analyzed arthropods (insects and spiders), skinks (*Eumeces multivirgatus epipleurotus*), small mammals (shrews, voles, and mice), and great horned owls (*Bubo virginianus*) for PCB congeners and organochlorine pesticides. Generally, concentrations of contaminants in these organisms were below the levels associated with adverse effects in lab toxicity studies and field studies on species in the same class as those of interest in this study. Great horned owls assumed to live on-site had two orders of magnitude higher concentrations of PCBs than an owl assumed to live off-site. Pesticide concentrations were generally not different comparing on-site with off-site. This finding may further substantiate the dominant source of DDT on the Pajarito Plateau, including at LANL, as a single indiscriminate spraying in 1963. Skinks and owls generally had between one and two orders of magnitude more DDE than small mammals, and arthropods had between one and three orders of magnitude less dioxin-like PCBs than the other classes of organisms. This result implies that arthropods may be relatively poor accumulators of organic contaminants, and, thus, arthropods may be poor indicators of exposure. The data also imply that soil ingestion may be the dominant pathway for lipophyllic organic contaminants into nonhuman biota given that the types of organisms with higher levels of measured organic contaminants, e.g., shrews, have feeding habits that are conducive of high soil intake (Gonzales et al., 2001a).

c. The Effects of Depleted Uranium on Amphibian Growth and Development. DU is the by-product of an enrichment process that increases the percentage of the isotope uranium-235 in natural uranium ore. The release of DU into the environment at LANL occurred primarily when weapon components or munitions were explosively detonated or impacted against a metal target at firing sites. Uranium is poorly soluble, and the canyons adjacent to the firing sites lack a constant flow of water into and through them. Nevertheless, chemical toxicity information is needed about areas within the Laboratory where runoff creates standing water that can be used as breeding pools and drinking water for amphibians, aquatic invertebrates, and terrestrial invertebrates.

A prior study on the chemical effects of DU on the water flea (*Ceriodaphnia dubia*) and amphipod (*Hyalella azteca*) indicated the potential for adverse biological effects only at concentrations considerably higher than have been measured in surface water or runoff at LANL (Kuhne 2000). However, amphibians can be very sensitive to contaminants. Various life stages of amphibians have been used as sensitive indicators and are standardized models of contaminant exposure. In our study, we (researchers from LANL, the US Geological Survey, and New Mexico State University) are characterizing the acute and chronic effects of DU on embryonic development and growth of two species of amphibians. Using the South African Clawed Frog (*Xenopus laevis*), we are applying a standardized test, Frog Embryo Teratogenesis Assay—*Xenopus* (FETAX), and will comparatively evaluate the toxicological effects of DU on Xenopus and on a species of frog that is native to the LANL environment—the chorus frog (*Pseudacris triseriata*) (Figure 6-6). The objective of our two-year study is to develop DU/amphibian toxicity benchmarks to which direct comparisons of field data can be made. Using the human chorionic gonadotropin to induce amplexus (reproduction), clawed frogs have been successfully bred and used in a series of pilot studies to develop and refine the techniques in the FETAX protocol. We are studying chorus frogs collected in northern New Mexico (Figure 6-7) to develop a captive breeding capability in the laboratory. Acute exposure (1.6–50 mg/L DU in solution) range-finding toxicity tests

(96 hr LC-50) have revealed no trend or concentration-response in malformation or mortality to date. Additional acute and chronic assays are underway (Gonzales et al., 2001b).

d. Radionuclides in Soils and Water Near a Low-Level Disposal Site and Potential Ecological and Human Health Impacts. Area G is adjacent to Pueblo of San Ildefonso lands. Pueblo residents and LANL scientists are concerned about radiological doses resulting from uptake of Area G radionuclides by mule deer and Rocky Mountain elk, then consumption of deer and elk meat by humans. We collected tissue samples from deer and elk killed near Area G by automobiles and analyzed them for tritium; strontium-90; uranium; plutonium-238 and plutonium-239, -240; americium-241; and cesium-137. We used these data to estimate human doses based on meat consumption rate of 23 kg/yr. We also used RESRAD, starting from a soil source term, to model human doses, and we estimated dose rates to deer and elk with a screening model. Dose estimates to humans from tissue consumption were $2.9 \times 10\text{-}3$ mSv/yr (0.29 mrem/yr) and $1.6 \times 10\text{-}3$ mSv/yr (0.16 mrem/yr) from deer and elk, respectively, and RESRAD dose estimates were of the same order of magnitude. Estimated dose rates to deer and elk were $2.1 \times 10\text{-}4$ mGy/d and $4.7 \times 10\text{-}4$ mGy/d, respectively. All estimated doses were significantly less than established exposure limits or guidelines (Ferenbaugh et al., 1999 and 2001).

5. Ecological Risk Assessment

a. Approach. Ecological risk assessment is the qualitative or quantitative appraisal of real or potential effects of stressors such as contamination on flora, fauna, or populations, communities, or ecosystems. The relationship between ecological risk assessment and environmental surveillance is several-fold. First, the ESP provides contaminant data for assessing trend, exposure, and potential effects on ecological entities. The data collected for surveillance programs include concentrations of contaminants in living and nonliving media, both of which are useful in ecological risk assessments. The data on contaminant levels in living organisms can also validate ecological risk models by comparing the accuracy of model predictions with real data. Second, the results of ecological risk assessments can help identify gaps in the ESP. For example, ecological risk assessments on threatened and endangered (T&E) species at LANL established the need to develop an organic-contaminant focus area as a component of the LANL ESP (Gonzales et al., 1998). Another example is the need for knowledge of contaminant levels in reptiles and amphibians native to the LANL environment and related potential risk.

The monitoring of organics for the ESP will help to focus additional ecological risk assessments. Thus, the relationship between the ESP and ecological risk assessment is mutualistic and iterative. As does the ESP, ecological risk assessments help identify special studies that enhance the basis on which environmental compliance is founded, and this is probably the most useful outcome of ecological risk assessments.

b. History. The Laboratory is in the early stages of an ecological risk assessment program that develops multiple lines of evidence. Prior focus has been on related pieces or components of ecological risk assessment such as monitoring and modeling of contaminant release, fate, and transport. In 1996, the Environmental Impact Statement Record of Decision on the DARHT at LANL specified, among other things, the requirement for closer observance of the federal Endangered Species Act of 1973. As a result of this requirement, between 1996 and 1999, we completed risk assessments on four T&E species and initiated related field studies. Previous Environmental Surveillance Reports have contained summaries of the T&E assessments. In 2000, we used a similar approach in assessing risk to non-T&E species, and a summary of the study is discussed below.

c. Tier 2 Ecological Risk Assessment of LANL Institutional Issues on the Pajarito Plateau Using ECORSK.6. LANL uses multiple lines of evidence to manage biological resources that are potentially impacted by small levels of contamination occurring in environmental media in some areas of its 43 mi^2. Ecological risk assessment provides one line of evidence for making decisions on managing these resources. This information on potential impact to biota is relative and is best used to help focus field studies or additional assessments on the particular contaminants, geographical areas, or biological endpoints needing attention. Ecological risk assessment also helps to ensure good environmental stewardship and response to concerns by the general public.

ECORSK.6 is a custom FORTRAN model that was developed as a tool specifically for conducting ecological risk assessments at LANL (Gonzales et al., 2001c). ECORSK.6 integrates geographical information system (GIS) data on environmental contamination and animal distribution with many other types of information such as contaminant toxicity so that animal exposures to contaminants can be estimated and compared with animal "safe limits." In fiscal year 2000, we used ECORSK.6 to assess potential impact from three contaminant types (radionuclides, organic chemicals, and metals) to the Rocky Mountain elk, the American robin (*Turdus migratorius*), and the deer mouse (*Peromyscus maniculatus*) across expansive areas of semidesert and forested habitat ranging up to 192 km^2 (74 mi^2). We will use the results to support the development of the Biological Resources Management Plan.

Results indicate no appreciable potential impacts to elk or robin and a small potential for impact to the deer mouse; however, natural and regional background sources of contamination contributed the dominant portion of total risk, indicating that the safe limits used may have been overly conservative (too low). Using overly conservative limits is common in the current state of the science.

We have met our goals of further developing the ECORSK tool as a technical programmatic capability and increasing the realism of the assessment approach. Using a receptor selection process that included input from multiple agencies and interest groups, we selected 21 species as important indicators of risk on the basis of social, ecological, risk, and model criteria. The use of real animal density data for placement and distribution of animal focal points and nest sites is an important advancement because it enables us to distribute animals on the basis of the distribution of their prey or forage. The variability of results as a function of changes in the safe limits (or toxicity reference values) and contaminant transfer coefficients demonstrates that more emphasis is needed on the development of accurate chronic toxicity benchmarks (safe limits) and site-specific transfer coefficients. In another important improvement to the approach, we demonstrated a simple method for interpolating (predicting) contaminant levels in canyon sediment at points where we intuitively know contamination exists based on measurements taken up-channel, but for which previous assessments assumed zero or background levels of contamination. The interpolation method was demonstrated for Los Alamos Canyon and is currently being applied to other canyons.

D. Other Environmental Surveillance Program Activities and Special Studies around LANL

1. Surveys of Fire Effects and Rehabilitation Treatments: First Year after the Cerro Grande Fire

During the summer of 2000, we surveyed portions of the Sierra de los Valles for the effects of the Cerro Grande fire, the distribution of rehabilitation treatments, and the residual fire hazards that occur in unburned areas. To do this, we obtained the reconnaissance data listed below at previously established and at newly established permanent plots. A total of 115 plot samples were obtained from June 6 to October 16. Most of these data were derived from plots that had been established before the fire from 1997 to 1999. However, we also established 28 new plots, and, of the 115 samples, 11 plots were sampled twice during the field season. These plots ranged from unburned to severely burned. Each plot was established or located in the field and photographed. The list of sampled variables expanded throughout the summer. We collected the following categories of reconnaissance data at many or all of the plots: location and land ownership; physical characteristics of the site; plant community type and dominant plant species; presence of Cerro Grande fire effects and the intensity of effects; presence or absence of rehabilitation treatments; soil depth and evidence of soil erosion; percent canopy cover of the forest overstory; percent cover of graminoids, herbs, shrubs, ash, litter, duff, bare soil, mosses, lichens, and size-classes of lithic materials; frequency of elk and deer pellet groups; counts of dead trees; and samples of the first ten centimeters of soil material. We transported the data to the lab where we stored them in a computer database and summarized them. The soils went to Stephen F. Austin State University where they are being analyzed for levels of nutrients and to LANL's Environmental Dynamics and Spatial Analysis Group (EES-10) where they are being analyzed for carbon content. We are currently analyzing the quantitative data for trends. We are also utilizing them as inputs to remote sensing analyses of fire effects and fire hazards and for the development of a post-fire land cover map. Finally, we are using the sample database to select sample plots for resampling during the upcoming field season and to identify gaps in the data that will require the addition of new permanent plots (Balice et al., 2001).

2. Estimation of Soil Erosion in Burned Forest Areas Resulting from the Cerro Grande Fire

The East Jemez Region has experienced two major wildfires in the past five years, as well as the recent Cerro Grande fire in 2000. It has been estimated that broad-scale wildfires will recur in this region once every ten years. To address this potential hazard, the Environment, Safety and Health Division's Technology Development, Evaluation, and Application (TDEA) program has provided funding for "A Wildfire Behavior Model for the Los Alamos Region and an Evaluation of Options for Mitigating Fire Hazards." The primary objectives of the Wildfire TDEA project are to model fire behavior in the LANL region and to develop actions to mitigate potential hazards. Another objective of the Wildfire TDEA project is to estimate the risk of wildfire-induced soil erosion in the LANL region. Post-fire soil erosion and storm water runoff can result in contaminant transport and flooding of downstream facilities. Identification of potential problem areas will allow us to design and implement mitigation actions to protect our environment and facilities. We are comparing two methods for estimating wildfire-induced surface soil erosion hazards. The first is the method the Interagency Burned Area Emergency Rehabilitation (BAER) Team used on the Cerro Grande fire. In this method, pre-fire Universal Soil Loss Equation (USLE) estimates of soil loss, from the Terrestrial Ecosystem Surveys of the Santa Fe National Forest, multiplied by five factors to account for burn severity and hydrophobic soils, resulted in post-fire soil erosion estimates. The second method (Enhanced USLE Approach) made estimates of soil erosion that incorporated multiple precipitation zones and estimates of changes in ground and canopy cover.

Because much of the data used in both approaches were similar, such as the data layers for the Soil Erodibility and Topographic Factors, the two approaches have some inherent similarities. For the pre-fire case, the soil loss estimates made by the BAER Team and the Enhanced USLE approaches both showed much lower soil erosion rates across the area burned by the Cerro Grande fire. However, a much larger proportion of the area had tolerable soil erosion (<2 ton/acre/year) using the Enhanced USLE Approach than that discovered by the BAER Team.

When the post-Cerro Grande fire soil erosion estimates were compared, the following differences were observed:

- The BAER Team post-fire estimates of soil loss were generally lower than the results from the Enhanced USLE Approach.
- The Enhanced USLE Approach pinpointed discrete areas needing conservation measures (Nyhan et al., 2001b).

3. Assessing Potential Risks from Exposure to Natural Uranium in Well Water

Over 50% of the wells in the Nambe region of northern New Mexico exceed the EPA's recommended drinking water standard of 20 μg/L (ppb) for uranium-238; the highest in the area was measured at 1200 μg U/L. We estimated uranium uptake in tomato (*Lycopersicon esculentum*), squash (*Cucurbita pepo*), lettuce (*Lactuca scarriola*), and radish (*Raphanus sativus*) irrigated with Nambe well water containing <1, 150, 500, and 1200 μg U/L. We evaluated plant uptake and human dose and toxicity associated with ingestion of water and produce and inhalation of irrigated soil related to gardening activities. Uranium concentration in plants increased linearly with increasing uranium concentration in irrigation water, particularly in lettuce and radish. The estimated total committed effective dose for 70 years of maximum continuous exposure, by the three pathways to well water containing 1200 μg U/L, was 0.17 mSv (17 mrem/yr) with a corresponding kidney concentration of 0.8 μg U/g (ppm) kidney (Hayes et al., 2000 and 2001).

E. Acknowledgements

This year was very challenging because of the Cerro Grande fire—we collected many more samples and analyzed many more constituents than in previous years. Thanks to the staff of ESH-20, Rick Velasquez, and Louie Naranjo for collecting and processing samples; CST-9, George Brooks, Richard Robinson, Sam Garcia, Lydia Apodoca, Edward Gonzales, Anthony Sanchez, Claudine Armenta, Eva Birnbaum, Cecily Boyett-Reyes, Mark Kozubal, Kathy Lao, Barbara Lopez, and Kathy Straw for radionuclide and trace element analysis; and Paragon Analytics of Fort Collins, CO, and Axys Analytical Services, Ltd., in Sidney, B.C., Canada, for other organic chemical analysis. Also, thanks to many of the ESH-20 undergraduate students (David Lujan, Adrian Martinez, and Chris Rae) for helping summarize, tabulate, and QA the data.

Table 6-1. Radionuclide Concentrations in Surface (0- to 2-inch depth) Soils Collected from Regional Background, Perimeter, and On-Site Locations during 2000 (after fire)

Location	^{3}H (pCi/mL)	^{90}Sr (pCi/g dry)	^{137}Cs (pCi/g dry)	^{tot}U (µg/g dry)	^{238}Pu (pCi/g dry)	$^{239,240}Pu$ (pCi/g dry)	^{241}Am (pCi/g dry)	Gross Alpha (pCi/g dry)	Gross Beta (pCi/g dry)	Gross Gamma (pCi/g dry)
Regional Background Stations:										
Embudo	0.03 (0.45)[a]	0.34 (0.09)	0.31 (0.05)	1.57 (0.16)	0.002 (0.001)	0.011 (0.002)	0.014 (0.004)	4.13 (1.25)	3.10 (1.04)	2.5 (0.2)
Cochiti	0.10 (0.46)	0.19 (0.09)	–0.03 (0.15)	1.58 (0.16)	0.001 (0.001)	0.001 (0.001)	0.002 (0.001)	1.34 (0.63)	0.64 (0.40)	2.4 (0.2)
Jemez	–0.06 (0.44)[b]	0.17 (0.09)	0.20 (0.04)	2.50 (0.25)	0.001 (0.001)	0.007 (0.001)	0.005 (0.002)	1.06 (0.56)	0.34 (0.28)	2.9 (0.3)
Bandelier (Cerro Grande)	0.23 (0.47)	0.07 (0.09)	0.36 (0.05)	2.60 (0.26)	0.001 (0.001)	0.020 (0.002)	0.005 (0.002)	6.60 (1.73)	3.91 (1.18)	2.7 (0.3)
Mean (std dev)	0.08 (0.12)	0.19 (0.11)	0.21 (0.17)	2.06 (0.56)	0.001 (0.001)	0.010 (0.008)	0.007 (0.005)	3.28 (2.61)	2.02 (1.8)	2.6 (0.2)
RSRL[c]	0.60	0.71	0.51	3.30	0.008	0.019	0.013	8.4	7.2	4.1
SAL[d]	6,400.00[e]	5.70	5.30	100.00	49.00	44.00	39.00	– – –	– – –	– – –
Perimeter Stations:										
Otowi	0.02 (0.45)	0.19 (0.09)	0.45 (0.06)	0.75 (0.08)	0.004 (0.001)	0.125 (0.007)	0.048 (0.004)	2.83 (0.97)	2.24 (0.83)	3.3 (0.3)
TA-8 (GT Site)	0.14 (0.46)	0.40 (0.10)	0.50 (0.07)	2.35 (0.24)	0.002 (0.001)	0.028 (0.003)	0.011 (0.003)	7.65 (1.95)	5.05 (1.42)	3.5 (0.3)
Near TA-49 (BNP)	0.24 (0.47)	0.40 (0.10)	0.39 (0.05)	3.78 (0.38)	0.002 (0.001)	0.020 (0.002)	0.004 (0.001)	7.54 (1.93)	4.62 (1.34)	3.1 (0.3)
East Airport	0.42 (0.49)	0.26 (0.10)	0.24 (0.04)	2.98 (0.30)	0.001 (0.000)	0.030 (0.003)	0.006 (0.002)	5.94 (1.60)	3.64 (1.12)	2.1 (0.2)
West Airport	0.29 (0.48)	0.28 (0.10)	0.20 (0.04)	3.14 (0.31)	0.002 (0.001)	0.060 (0.005)	0.002 (0.001)	5.95 (1.61)	3.50 (1.09)	2.7 (0.3)
North Mesa	0.30 (0.48)	0.31 (0.10)	0.15 (0.03)	2.82 (0.28)	0.000 (0.000)	0.012 (0.002)	0.002 (0.001)	5.26 (1.47)	3.40 (1.07)	2.7 (0.3)
Sportsman's Club	0.27 (0.48)	0.15 (0.09)	0.32 (0.05)	3.59 (0.36)	0.001 (0.001)	0.024 (0.003)	0.007 (0.002)	6.58 (1.74)	4.81 (1.38)	2.9 (0.3)
Tsankawi/PM-1	0.11 (0.46)	0.27 (0.09)	0.18 (0.04)	5.54 (0.55)	0.001 (0.001)	0.013 (0.002)	0.006 (0.001)	3.97 (1.20)	2.90 (0.96)	4.4 (0.4)
White Rock (East)	0.42 (0.49)	0.30 (0.10)	0.11 (0.02)	2.22 (0.22)	0.001 (0.001)	0.008 (0.001)	0.001 (0.001)	6.96 (1.81)	3.80 (1.16)	3.1 (0.3)
San Ildefonso	0.12 (0.46)	0.32 (0.10)	0.25 (0.04)	2.75 (0.28)	0.001 (0.001)	0.010 (0.002)	0.002 (0.001)	3.55 (1.11)	2.50 (0.87)	2.8 (0.3)
Mean (std dev)	0.23 (0.13)*[f]	0.29 (0.08)	0.28 (0.13)	2.99 (1.23)*	0.002 (0.001)	0.033 (0.036)	0.009 (0.014)	5.62 (1.69)	3.65 (0.96)	3.1 (0.6)*
On-Site Stations:										
TA-16 (S-Site)	0.10 (0. 46)	0.46 (0.10)	0.58 (0.07)	4.57 (0.46)	0.000 (0.001)	0.032 (0.003)	0.011 (0.003)	10.20 (2.44)	6.83 (1.78)	3.7 (0.4)
TA-21 (DP-Site)	1.51 (0.58)	0.23 (0.09)	0.25 (0.05)	4.50 (0.45)	0.003 (0.001)	0.096 (0.005)	0.056 (0.006)	6.49 (1.72)	3.44 (1.09)	3.0 (0.3)
Near TA-33	1.67 (0.60)	0.26 (0.09)	0.33 (0.05)	2.65 (0.27)	0.007 (0.001)	0.019 (0.002)	0.009 (0.002)	6.42 (1.71)	4.11 (1.23)	3.0 (0.3)
TA-50	0.76 (0.52)	0.20 (0.09)	0.07 (0.02)	3.16 (0.32)	0.001 (0.001)	0.039 (0.003)	0.013 (0.003)	6.34 (1.69)	3.48 (1.10)	3.1 (0.3)
TA-51	–0.09 (0.44)	0.36 (0.11)	0.36 (0.05)	4.15 (0.42)	0.002 (0.001)	0.026 (0.003)	0.008 (0.002)	6.51 (1.72)	4.29 (1.26)	3.3 (0.3)
West of TA-53	1.01 (0.54)	0.09 (0.10)	0.20 (0.04)	3.93 (0.39)	0.002 (0.001)	0.032 (0.003)	0.009 (0.002)	5.57 (1.54)	3.53 (1.11)	3.1 (0.3)
East of TA-53	0.57 (0.50)	0.21 (0.10)	0.53 (0.07)	3.18 (0.32)	0.001 (0.001)	0.042 (0.004)	0.015 (0.003)	5.41 (1.51)	3.76 (1.16)	3.3 (0.3)
East of TA-54	0.90 (0.53)	0.21 (0.09)	0.23 (0.04)	2.77 (0.28)	0.012 (0.002)	0.028 (0.003)	0.010 (0.002)	3.83 (1.19)	2.89 (0.97)	3.4 (0.3)
Potrillo Drive/TA-36	0.39 (0.49)	0.27 (0.10)	0.21 (0.03)	3.18 (0.32)	0.001 (0.001)	0.010 (0.001)	0.003 (0.001)	5.13 (1.44)	3.10 (1.01)	3.1 (0.3)
Near Test Well DT-9	–0.14 (0.44)	0.38 (0.10)	0.22 (0.04)	2.57 (0.26)	0.001 (0.001)	0.010 (0.002)	0.005 (0.002)	5.24 (1.47)	3.89 (1.19)	3.1 (0.3)
R-Site Road East	0.24 (0.47)	0.18 (0.11)	0.35 (0.05)	4.53 (0.45)	0.001 (0.001)	0.012 (0.002)	0.004 (0.001)	8.47 (2.09)	4.76 (1.35)	3.1 (0.3)
Two-Mile Mesa	0.11 (0.46)	0.33 (0.09)	0.23 (0.04)	2.83 (0.28)	0.001 (0.001)	0.016 (0.002)	0.007 (0.002)	6.49 (1.71)	3.73 (1.14)	3.0 (0.3)
Mean (std dev)	0.59 (0.60)*	0.27 (0.10)	0.30 (0.14)	3.50 (0.78)*	0.003 (0.003)	0.030 (0.023)	0.013 (0.014)	6.3 (1.65)*	3.98 (1.03)*	3.2 (0.2)*

Table 6-1. Radionuclide Concentrations in Surface (0- to 2-inch depth) Soils Collected from Regional Background, Perimeter, and On-Site Locations during 2000 (after fire) (Cont.)

Location	^{234}U (pCi/g dry)	^{235}U (pCi/g dry)	^{238}U (pCi/g dry)
Regional Background Stations:			
Embudo	0.459 (0.037)	0.0162 (0.0087)	0.459 (0.037)
Cochiti	0.490 (0.033)	0.0134 (0.0061)	0.460 (0.032)
Jemez	0.727 (0.033)	0.0283 (0.0063)	0.777 (0.035)
Bandelier (Cerro Grande)	0.249 (0.017)	0.0079 (0.0035)	0.235 (0.016)
Mean (std dev)	0.481 (0.196)	0.0165 (0.0086)	0.483 (0.223)
RSRL[c]	0.501	0.0337	0.929
SAL[d]	63.0	17.0	93.0
Perimeter Stations:			
Otowi	0.216 (0.015)	0.0066 (0.0037)	0.212 (0.015)
TA-8 (GT Site)	0.685 (0.052)	0.0470 (0.0138)	0.827 (0.058)
Near TA-49 (BNP)	1.170 (0.071)	0.0525 (0.0139)	1.221 (0.073)
East Airport	0.768 (0.044)	0.0287 (0.0080)	0.898 (0.048)
West Airport	0.863 (0.037)	0.0404 (0.0071)	0.932 (0.039)
North Mesa	0.822 (0.037)	0.0280 (0.0069)	0.796 (0.036)
Sportsman's Club	0.955 (0.036)	0.0369 (0.0063)	0.993 (0.037)
Tsankawi/PM-1	0.623 (0.031)	0.0224 (0.0060)	0.695 (0.033)
White Rock (East)	1.565 (0.060)	0.0632 (0.0094)	1.653 (0.062)
San Ildefonso	0.816 (0.035)	0.0394 (0.0070)	0.816 (0.035)
Mean (std dev)	0.848 (0.352)*	0.0365 (0.0161)*	0.904 (0.368)*
On-Site Stations:			
TA-16 (S-Site)	1.277 (0.051)	0.0523 (0.0086)	1.341 (0.053)
TA-21 (DP-Site)	1.279 (0.067)	0.0592 (0.0125)	1.303 (0.067)
Near TA-33	0.844 (0.037)	0.0496 (0.0081)	0.848 (0.037)
TA-50	0.923 (0.040)	0.0459 (0.0081)	0.981 (0.042)
TA-51	1.040 (0.046)	0.0382 (0.0080)	1.097 (0.048)
West of TA-53	0.926 (0.062)	0.0563 (0.0142)	1.027 (0.066)
East of TA-53	0.792 (0.033)	0.0378 (0.0065)	0.808 (0.033)
East of TA-54	0.858 (0.037)	0.0288 (0.0060)	0.808 (0.035)
Potrillo Drive/TA-36	0.894 (0.040)	0.0389 (0.0077)	0.936 (0.041)
Near Test Well DT-9	0.742 (0.047)	0.0488 (0.0117)	0.764 (0.047)
R-Site Road East	0.657 (0.045)	0.0307 (0.0111)	0.665 (0.045)
Two-Mile Mesa	0.781 (0.034)	0.0376 (0.0069)	0.866 (0.037)
Mean (std dev)	0.918 (0.195)*	0.0437 (0.0098)*	0.954 (0.209)*

[a] (±1 counting uncertainty); values are the uncertainty of the analytical results at the 65% confidence level.
[b] See Appendix B for an explanation of the presence of negative values.
[c] Regional Statistical Reference Level; this is the upper-limit background concentration (mean + 2 std dev) based on data from 1995 to 1999.
[d] Los Alamos National Laboratory Screening Action Level (ER 2001).
[e] Equivalent to the SAL of 880 pCi/g dry soil at 12% moisture.
[f] Means within the same column followed by an * were statistically higher than regional background using a Wilcoxon Rank Sum Test at the 0.05 probability level.

Table 6-2. Mean (±SD) Radionuclide Concentrations in Surface (0- to 2-inch depth) Soils Collected from Regional Background, Perimeter, and On-Site Locations Before (1999) and After (2000) the Cerro Grande Fire[a]

Location Date	^{3}H (pCi/mL)	^{90}Sr (pCi/g dry)	^{137}Cs (pCi/g dry)	^{tot}U (µg/g dry)	^{238}Pu (pCi/g dry)	$^{239,240}Pu$ (pCi/g dry)	^{241}Am (pCi/g dry)	Alpha (pCi/g dry)	Beta (pCi/g dry)	Gamma (pCi/g dry)
Regional Background Stations[b]										
1999[c]	0.21	0.30	0.23	1.78	0.001	0.012	0.011	3.1	2.8	2.1
	(0.64)	(0.07)	(0.06)	(0.18)	(0.001)	(0.002)	(0.003)	(0.6)	(0.3)	(0.2)
2000	0.03	0.34	0.31	1.57	0.002	0.011	0.014	4.1	3.2	2.5
	(0.45)	(0.09)	(0.05)	(0.16)	(0.001)	(0.002)	(0.004)	(1.3)	(1.0)	(0.2)
Perimeter Stations[d]										
1999[c]	0.32	0.34	0.45	2.93	0.007	0.039	0.007	5.0	4.3	4.4
	(0.09)	(0.18)	(0.29)	(0.58)	(0.006)	(0.040)	(0.004)	(1.1)	(1.2)	(1.6)
2000	0.23	0.29	0.28	2.99	0.002	0.033	0.009	5.6	3.7	3.1
	(0.13)	(0.08)	(0.13)	(1.23)	(0.001)	(0.036)	(0.014)	(1.7)	(1.0)	(0.6)
On-Site Stations (LANL)[e]										
1999[c]	0.39	0.42	0.36	4.12	0.005	0.025	0.014	5.9	4.1	3.4
	(0.59)	(0.18)	(0.16)	(1.75)	(0.006)	(0.015)	(0.015)	(1.4)	(1.2)	(0.7)
2000	0.59	0.27	0.30	3.50	0.003	0.032	0.013	6.3	4.0	3.2
	(0.60)	(0.10)	(0.14)	(0.78)	(0.004)	(0.023)	(0.015)	(1.7)	(1.0)	(0.2)

[a] Data from Fresquez et al. (2000a). The mean radionuclide concentrations showed no statistical differences between the years using a Wilcoxon Rank Sum Test at the 0.05 probability level.
[b] Represents Embudo only; this was the only regional background station out of three that was located predominantly downwind of the Cerro Grande fire (and LANL).
[c] Fresquez and Gonzales (2000).
[d] Represents 10 perimeter stations; four located on north side, four on east side, one on west side, and one on southwest side of LANL.
[e] Represents 12 on-site (LANL) stations.

Table 6-3. Radionuclide Concentrations in Garden Tilled Surface (0- to 2-inch depth) Soils Collected from Regional Organic Farming Locations in Northern New Mexico after the Cerro Grande Fire

Location	^{3}H (pCi/mL)	^{90}Sr (pCi/g dry)	^{137}Cs (pCi/g dry)	^{tot}U (μg/g dry)	^{238}Pu (pCi/g dry)	$^{239,240}Pu$ (pCi/g dry)	^{241}Am (pCi/g dry)	Alpha (pCi/g dry)	Beta (pCi/g dry)	Gamma (pCi/g dry)
Soils from Tilled Farming Areas Directly Downwind of the CG Fire										
Ojo Sarco	0.04	0.08	0.158	1.78	0.001	0.006	0.004	3.4	2.0	1.9
	(0.45)[a]	(0.09)	(0.033)	(0.18)	(0.000)	(0.001)	(0.001)	(1.1)	(0.8)	(0.2)
Embudo	0.00	0.04	0.124	1.22	0.002	0.006	0.002	2.7	2.0	1.7
	(0.45)	(0.09)	(0.035)	(0.12)	(0.001)	(0.001)	(0.001)	(0.9)	(0.8)	(0.2)
Española	0.06	0.02	0.036	1.94	0.000	0.011	0.012	3.1	2.4	1.9
	(0.45)	(0.09)	(0.022)	(0.19)	(0.000)	(0.002)	(0.002)	(1.0)	(0.9)	(0.2)
Abiquiu	0.03	0.11	0.420	2.44	0.007	0.013	0.003	2.4	1.9	5.5
	(0.45)	(0.09)	(0.055)	(0.24)	(0.001)	(0.002)	(0.001)	(0.9)	(0.7)	(0.6)
Soils from Tilled Farming Areas Not Directly Downwind of the CG Fire										
Cochiti	–0.17	0.04	0.122	2.06	0.002	0.003	0.001	2.8	2.5	3.4
	(0.45)[b]	(0.10)	(0.031)	(0.21)	(0.001)	(0.001)	(0.000)	(1.0)	(0.9)	(0.3)
Pecos	–0.13	0.21	0.225	3.61	0.000	0.007	0.002	4.9	2.9	3.5
	(0.45)	(0.10)	(0.037)	(0.36)	(0.000)	(0.001)	(0.001)	(1.4)	(1.0)	(0.3)

[a] (±1 counting uncertainty); values are the uncertainty of the analytical results at the 65% confidence level.
[b] See Appendix B for an explanation of the presence of negative values.

Table 6-4. Total Recoverable Trace Element Concentrations (µg/g dry) in Surface (0- to 2-inch depth) Soils Collected from Regional Background, Perimeter, and On-Site Locations during 2000 (after fire)[a]

Location	Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe	Hg
Regional Background Stations												
Embudo	1.0[b]	5,700.0	1.1	1.5[b]	79.0	0.41	0.20[b]	3.7	7.0	3.7	7,900.0	0.01[b]
Cochiti	1.0[b]	11,000.0	3.4	1.5[b]	130.0	0.57	0.20[b]	5.5	9.2	7.5	14,000.0	0.01[b]
Jemez	1.0[b]	12,000.0	2.7	1.5[b]	150.0	0.63	0.20[b]	5.7	17.0	1.4	14,000.0	0.01[b]
Bandelier (Cerro Grande)	1.0[b]	8,900.0	1.8	1.5[b]	160.0	0.69	0.20[b]	5.5	6.6	3.7	9,600.0	0.02
Mean	1.0	9,400.0	2.3	1.5	129.8	0.58	0.20	5.1	10.0	4.1	11,375.0	0.01
(std dev)	(0.0)	(2,784.5)	(1.0)	(0.0)	(36.1)	(0.12)	(0.00)	(0.9)	(4.8)	(2.5)	(3,109.5)	(0.01)
RSRL[c]	<2.0	36,600.0	6.1	16.7	194.0	0.73	<0.40	6.7	14.7	11.0	21,800.0	0.04
SAL[d]	390.0	76,000.0	6.1	5,500.0	5,400.0	150.00	39.00	3,400.0	210.0	2,900.0	23,000.0	23.00
Perimeter Stations												
Otowi	1.0[b]	7,100.0	0.8	1.5[b]	76.0	0.58	0.20[b]	4.0	8.1	3.6	9,300.0	0.01[b]
TA-8 (GT Site)	1.0[b]	7,200.0	1.7	1.5[b]	98.0	0.52	0.20[b]	3.9	6.1	5.9	8,900.0	0.02
TA-49 (BNP)	1.0[b]	8,000.0	1.9	1.5[b]	130.0	0.76	0.20[b]	5.8	7.7	4.7	9,900.0	0.01
East Airport	1.0[b]	12,000.0	2.5	1.5[b]	97.0	0.95	0.20[b]	5.8	10.0	6.1	12,000.0	0.01
West Airport	1.0[b]	11,000.0	2.8	1.5[b]	140.0	0.96	0.20[b]	7.3	10.0	6.9	12,000.0	0.02
North Mesa	1.0[b]	11,000.0	3.2	1.5[b]	120.0	0.86	0.20[b]	7.2	11.0	6.2	14,000.0	0.02
Sportsman's Club	1.0[b]	9,200.0	2.3	1.5[b]	150.0	1.10	0.20[b]	14.0	8.6	5.5	12,000.0	0.02
Tsankawi/PM-1	1.0[b]	8,700.0	1.5	1.5[b]	37.0	0.92	0.20[b]	3.4	11.0	6.0	8,400.0	0.01
White Rock (East)	1.0[b]	9,500.0	2.4	1.5[b]	130.0	1.20	0.20[b]	4.7	7.3	6.1	9,900.0	0.00
San Ildefonso	1.0[b]	5,700.0	1.5	1.5[b]	78.0	0.67	0.20[b]	4.5	5.7	4.1	7,500.0	0.01
Mean	1.0	8,940.0	2.1	1.5	105.6	0.85*[e]	0.20	6.1	8.6	5.5	10,390.0	0.01
(std dev)	(0.0)	(2,002.3)	(0.7)	(0.0)	(35.0)	(0.22)	(0.00)	(3.1)	(1.9)	(1.0)	(2,027.8)	(0.01)

Table 6-4. Total Recoverable Trace Element Concentrations (µg/g dry) in Surface (0- to 2-inch depth) Soils Collected from Regional Background, Perimeter, and On-Site Locations during 2000 (after fire)[a] (Cont.)

Location	Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe	Hg
On-Site Stations												
TA-16 (S-Site)	1.0[b]	15,000.0	2.9	1.5[b]	160.0	1.00	0.20[b]	4.8	11.0	6.8	11,000.0	0.02
TA-21 (DP-Site)	1.0[b]	5,700.0	2.1	1.5[b]	89.0	0.59	0.20[b]	6.0	7.4	4.1	9,300.0	0.01
Near TA-33	1.0[b]	12,000.0	1.1	1.5[b]	110.0	0.78	0.20[b]	4.0	6.4	3.5	8,500.0	0.01
TA-50	1.0[b]	9,600.0	2.2	1.5[b]	110.0	0.90	0.53	4.5	7.8	4.6	9,900.0	0.01
TA-51	1.0[b]	12,000.0	2.2	1.5[b]	140.0	0.87	0.20[b]	6.9	10.0	6.1	12,000.0	0.02
West of TA-53	1.0[b]	8,900.0	0.8	1.5[b]	110.0	1.00	0.20[b]	7.0	8.7	5.2	11,000.0	0.02
East of TA-53	1.0[b]	4,400.0	2.1	1.5[b]	48.0	0.57	0.20[b]	1.7	3.1	2.0	4,500.0	0.01
Potrillo Drive/TA-36	1.0[b]	5,900.0	1.4	1.5[b]	57.0	0.62	0.20[b]	3.0	4.1	1.8	7,400.0	0.01[b]
East of TA-54	1.0[b]	16,000.0	3.7	1.5[b]	99.0	0.78	0.20[b]	7.2	17.0	5.9	14,000.0	0.02
Near Test Well DT-9	1.0[b]	8,800.0	2.0	1.5[b]	110.0	0.81	0.20[b]	5.5	7.9	3.5	11,000.0	0.01
R-Site Road	1.0[b]	11,000.0	2.7	1.5[b]	140.0	0.97	0.20[b]	6.7	9.6	4.9	12,000.0	0.02
Two-Mile Mesa	1.0[b]	18,000.0	4.4	1.5[b]	140.0	1.00	0.20[b]	8.2	14.0	6.6	16,000.0	0.02
Mean	1.0	10,608.3	2.3	1.5	109.4	0.82*	0.23	5.5	8.9	4.6	10,550.0	0.02
(std dev)	(0.0)	(4,253.7)	(1.0)	(0.0)	(33.6)	(0.16)	(0.10)	(1.9)	(3.9)	(1.7)	(3,001.9)	(0.01)

Table 6-4. Total Recoverable Trace Element Concentrations (µg/g dry) in Surface (0- to 2-inch depth) Soils Collected from Regional Background, Perimeter, and On-Site Locations during 2000 (after fire)[a] (Cont.)

Location	Mn	Mo	Ni	Pb	Sb	Se	Sn	Ti	Tl	V	Zn	CN
Regional Background Stations												
Embudo	190.0	2.5[b]	5.1	7.0	0.1[b]	0.4	2.5[b]	40.0	0.1[b]	12.0	23.0	0.2[b]
Cochiti	340.0	2.5[b]	6.5	7.0	0.1[b]	0.6	2.5[b]	63.0	0.1[b]	27.0	35.0	0.2[b]
Jemez	490.0	2.5[b]	9.8	8.0	0.1[b]	0.7	2.5[b]	59.0	0.1[b]	23.0	32.0	0.2[b]
Bandelier (Cerro Grande)	700.0	2.5[b]	6.2	14.0	0.1[b]	0.7	2.5[b]	170.0	0.1[b]	13.0	40.0	0.4
Mean	430.0	2.5	6.9	9.0	0.1	0.6	2.5	83.0	0.1	18.8	32.5	0.3
(std dev)	(217.7)	(0.0)	(2.0)	(3.0)	(0.0)	(0.1)	(0.0)	(58.9)	(0.0)	(7.4)	(7.1)	(0.1)
RSRL[c]	421.0	0.8	10.5	14.0	<0.4	0.6	15.9	200.7	<0.4	40.1	49.0	0.5
SAL[d]	3,200.0	390.0	1,600.0	400.0	31.0	390.0	47,000.0	NA	5.5	550.0	23,000.0	1,200.0
Perimeter Stations												
Otowi	240.0	2.5[b]	3.7	9.0	0.1[b]	0.2b	2.5[b]	300.0	0.1[b]	18.0	30.0	1.8
TA-8 (GT Site)	430.0	2.5[b]	5.0	16.0	0.1[b]	0.5	2.5[b]	200.0	0.1[b]	12.0	33.0	0.2[b]
TA-49 (BNP)	380.0	2.5[b]	5.9	14.0	0.1[b]	0.5	2.5[b]	130.0	0.2	16.0	23.0	0.2[b]
East Airport	380.0	2.5[b]	8.3	23.0	0.1[b]	0.6	2.5[b]	130.0	0.3	17.0	65.0	0.6
West Airport	480.0	2.5[b]	8.4	20.0	0.1[b]	0.6	2.5[b]	89.0	0.2	19.0	53.0	0.2
North Mesa	470.0	2.5[b]	7.7	17.0	0.1[b]	0.7	2.5[b]	180.0	0.2	23.0	41.0	0.2
Sportsman's Club	1,200.0	2.5[b]	8.8	18.0	0.1[b]	0.5	2.5[b]	46.0	0.3	19.0	34.0	0.6
Tsankawi/PM-1	220.0	2.5[b]	12.0	21.0	0.1[b]	0.5	2.5[b]	240.0	0.2	9.3	43.0	0.1[b]
White Rock (East)	300.0	2.5[b]	8.7	16.0	0.1[b]	0.6	2.5[b]	20.0	0.3	11.0	44.0	0.2
San Ildefonso	330.0	2.5[b]	4.1	11.0	0.1[b]	0.4	2.5[b]	42.0	0.1[b]	11.0	34.0	0.4
Mean	443.0	2.5	7.3	17.0*	0.1	0.5	2.5	137.7	0.2	15.5	40.0	0.5
(std dev)	(280.4)	(0.0)	(2.6)	(4.0)	(0.0)	(0.1)	(0.0)	(92.1)	(0.1)	(4.5)	(12.2)	(0.5)

Table 6-4. Total Recoverable Trace Element Concentrations (µg/g dry) in Surface (0- to 2-inch depth) Soils Collected from Regional Background, Perimeter, and On-Site Locations during 2000 (after fire)[a] (Cont.)

Location	Mn	Mo	Ni	Pb	Sb	Se	Sn	Ti	Tl	V	Zn	CN
On-Site Stations												
TA-16 (S-Site)	320.0	2.5[b]	8.3	13.0	0.1[b]	0.7	2.5[b]	280.0	0.6	17.0	34.0	0.4
TA-21 (DP-Site)	310.0	2.5[b]	6.0	19.0	0.1[b]	0.6	2.5[b]	83.0	0.1[b]	16.0	29.0	0.2[b]
Near TA-33	240.0	2.5[b]	6.0	11.0	0.1[b]	0.2[b]	2.5[b]	65.0	0.1[b]	9.2	25.0	0.2[b]
TA-50	250.0	2.5[b]	5.2	16.0	0.1[b]	0.2[b]	2.5[b]	97.0	0.5	14.0	42.0	0.2[b]
TA-51	480.0	2.5[b]	7.6	12.0	0.1[b]	0.5	2.5[b]	250.0	0.2	20.0	36.0	0.8
West of TA-53	460.0	2.5[b]	7.3	15.0	0.1[b]	0.2[b]	2.5[b]	80.0	0.2	17.0	28.0	0.2[b]
East of TA-53	160.0	2.5[b]	1.0[b]	11.0	0.1[b]	0.6	2.5[b]	7.0	0.1[b]	4.7	19.0	0.2[b]
Potrillo Drive/TA-36	280.0	2.5[b]	4.1	9.0	0.1[b]	0.5	2.5[b]	68.0	0.1[b]	7.4	35.0	0.6
East of TA-54	380.0	2.5[b]	9.7	16.0	0.1[b]	0.5	2.5[b]	340.0	0.3	28.0	39.0	0.2
Near Test Well DT-9	310.0	2.5[b]	5.1	13.0	0.1[b]	0.5	2.5[b]	110.0	0.2	15.0	26.0	0.2[b]
R-Site Road	510.0	2.5[b]	6.4	15.0	0.1[b]	0.6	2.5[b]	210.0	0.2	20.0	30.0	0.4
Two-Mile Mesa	460.0	2.5[b]	8.9	29.0	0.1[b]	0.6	2.5[b]	200.0	0.8	27.0	35.0	0.2
Mean	346.7	2.5	6.3	15.0*	0.1	0.5	2.5	149.2	0.3	16.3	31.5	0.3
(std dev)	(110.7)	(0.0)	(2.4)	(5.0)	(0.0)	(0.2)	(0.0)	(103.3)	(0.2)	(7.1)	(6.5)	(0.2)

[a] Trace elements were digested using EPA method 3051 and analyzed using EPA method 6020 (Sb, Tl, Pb), 7000A (As, Se), 7471A (Hg) and 6010B (all others).
[b] All less-than values were converted to one-half the concentration.
[c] Regional Statistical Reference Level; this is the upper-limit background concentration (mean + 2 std dev) based on data from 1992 to 1999 (Fresquez and Gonzales, 2000; Fresquez et al., 2001a).
[d] Los Alamos National Laboratory Screening Action Level (EPA 2000).
[e] Means within the same column followed by an * were statistically higher than regional background using a Wilcoxon Rank Sum Test at the 0.05 probability level.

Table 6-5. Mean (±SD) Total Recoverable Trace Element Concentrations (μg/g dry) in Surface (0- to 2-inch depth) Soils Collected from Regional Background, Perimeter, and On-Site Locations Before (1999) and After (2000) the Cerro Grande Fire[a,b]

Location/Date	Ag	Al	As	Ba	Be	Cd	Co	Cr	Cu	Fe
Regional Background Stations[c]										
1999[d]	1.0	2.9	1.0	87	0.62	0.20	4.3	12.0	5.7	1.4
2000	1.0	0.6	1.1	79	0.41	0.20	3.7	7.0	3.7	0.8
Perimeter Stations[e]										
1999[d]	1.0	3.3	1.9	91	0.84	0.23	4.7	8.1	5.9	1.2
	(0.00)	(0.09)	(0.8)	(29)	(0.25)	(0.09)	(1.7)	(3.2)	(1.5)	(0.23)
2000	1.0	0.9	2.1	106	0.85	0.20	6.1	8.6	5.5	1.0
	(0.00)	(0.02)	(0.7)	(35)	(0.22)	(0.00)	(3.1)	(1.9)	(1.0)	(0.02)
On-Site Stations (LANL)[f]										
1999[d]	1.0	3.4	2.4	109	0.87	0.23	5.2	7.7	6.0	1.3
	(0.0)	(0.46)	(0.7)	(29)	(0.16)	(0.09)	(1.4)	(2.5)	(1.8)	(0.25)
2000	1.0	1.1	2.3	109	0.82	0.23	5.5	8.9	4.6	1.1
	(0.0)	(0.04)	(1.0)	(34)	(0.16)	(0.10)	(1.9)	(3.9)	(1.7)	(0.03)

Table 6-5. Mean (±SD) Total Recoverable Trace Element Concentrations (μg/g dry) in Surface (0- to 2-inch depth) Soils Collected from Regional Background, Perimeter, and On-Site Locations Before (1999) and After (2000) the Cerro Grande Fire[a,b] (Cont.)

Location/Date	Hg	Mn	Ni	Pb	Sb	Se	Tl	V	Zn	CN
Regional Background Stations[c]										
1999[d]	0.01	229	6.4	12	0.1	0.2	0.1	20	26	
2000	0.01	190	5.1	7	0.1	0.4	0.1	12	23	0.20
Perimeter Stations[e]										
1999[d]	0.02	382	4.8	20	0.1	0.2	0.2	15	33	
	(0.01)	(135)	(2.2)	(7.8)	(0.07)	(0.00)	(0.08)	(6.7)	(8.4)	
2000	0.01	443	7.3	17	0.1	0.5	0.2	16	40	0.50
	(0.01)	(280)	(2.6)	(4.0)	(0.00)	(0.10)	(0.10)	(4.5)	(12.2)	(0.50)
On-Site Stations (LANL)[f]										
1999[c]	0.05	349	5.2	14	0.2	0.2	0.2	21	34	
	(0.13)	(129)	(1.7)	(2.8)	(0.00)	(0.00)	(0.06)	(4.5)	(7.4)	
2000	0.02	347	6.3	15	0.1	0.5	0.3	16	32	0.30
	(0.01)	(111)	(2.4)	(5.0)	(0.00)	(0.20)	(0.20)	(7.1)	(6.5)	(0.20)

[a] All trace elements, with the exception of Al and Fe, are reported on a ppm basis. Al and Fe are reported on a percent basis.
[b] Data from Fresquez et al. (2000).
[c] Represents Embudo only; this was the only regional station out of three that was located predominantly downwind of the Cerro Grande fire (and LANL).
[d] Fresquez and Gonzales (2000).
[e] Represents 10 perimeter stations; four located on north side, four on east side, one on west side, and one on southwest side of LANL.
[f] Represents 12 on-site (LANL) stations.

Table 6-6. Organic Compound Concentrations in Surface (0- to 6-inch depth) Soils Collected from Regional, Perimeter, and On-Site Stations during 2000 (after fire)[a]

Location	VOC[b] (ppb)	SVOC[c] (ppb)	PEST[d] (ppb)	PCB[e] (ppb)	HE[f] (ppb)	Dioxins[g] (ppt)
Regional Background Stations						
Embudo	ND	ND[h]				OCDD (13.6)[i]
Cochiti	ND	ND				OCDD (12.0)
Jemez	ND	ND				
Bandelier (Cerro Grande)			ND	ND	ND	ND
Perimeter Stations						
Otowi	ND	ND				
TA-8 (GT Site)	ND	ND				
Near TA-49 (BNP)	ND	ND				
East Airport	ND	ND				
West Airport	ND	ND	ND	ND	ND	HpCDD (3.7)[j] OCDD (28.1)
North Mesa	ND	ND				
Sportsman's Club	ND	ND				
Tsankawi/PM-1	ND	ND				
White Rock (East)	ND	ND	ND	ND	ND	
San Ildefonso	ND	ND				
On-Site Stations						
TA-16 (S-Site)	ND	ND	ND	ND	ND	OCDD (10.0)[k]
TA-21 (DP-Site)	ND	ND				
Near TA-33	ND	ND				
TA-50	ND	ND				
TA-51	ND	ND				
West of TA-53	ND	ND				
East of TA-53	ND	ND				
East of TA-54	ND	ND				
Potrillo Drive/TA-36	ND	ND				
Near Test Well DT-9	ND	ND				
R-Site Road East	ND	ND	ND	ND	ND	OCDD (10.0)[k]
Two-Mile Mesa	ND	ND	ND	ND	ND	OCDD (10.0)[k]

[a] Data from Fresquez et al. (2000).
[b] VOC = Volatile Organic Compounds (36 compounds).
[c] SVOC = Semivolatile Organic Compounds (71 compounds).
[d] PEST= Pesticides (organochlorine) (21 compounds).
[e] PCB = Polychlorinated biphenyls (7 compounds).
[f] HE = High Explosives (14 compounds).
[g] Dioxin and dioxin-like compounds (7 compounds).
[h] ND = Not Detected above reporting limits.
[i] OCDD = 1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin.
[j] HpCDD = 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin.
[k] These data reflect concentrations of OCDD detected in a composite sample soil from TA-16 (S-Site), R-Site Road East, and Two-Mile Mesa soils.

Table 6-7. Total Recoverable Trace Element Concentrations (µg/g dry) in Garden Tilled Surface (0- to 2-inch depth) Soils Collected from Regional Organic Farming Locations in Northern New Mexico after the Cerro Grande Fire[a]

Location	Ag	As	Ba	Be	Cd	Co	Cr	Hg	Ni	Pb	Sb	Se	Tl	Zn
Soils from Tilled Organic Farming Areas Directly Downwind of the Cerro Grande Fire														
Ojo Sarco	1.0[b]	4.5	160	0.94	0.2[b]	5.5	14.0	0.005[b]	12.0	12.2	0.2[b]	0.2[b]	0.2[b]	43
Embudo	1.0[b]	3.1	68	0.52	0.2[b]	4.2	11.0	0.005[b]	10.0	6.7	0.2[b]	0.2[b]	0.2[b]	51
Española	1.0[b]	3.1	94	0.65	0.7	3.9	21.0	0.005[b]	12.0	7.8	0.2[b]	1.7	0.2[b]	52
Abiquiu	1.0[b]	6.8	180	1.20	0.2[b]	7.0	20.0	0.005[b]	16.0	13.2	0.2[b]	0.8	0.2[b]	60
Soils from Tilled Organic Farming Areas Not Directly Downwind of the Cerro Grande Fire (Control)														
Cochiti	1.0[b]	1.9	87	0.46	0.2[b]	3.3	6.6	0.005[b]	6.4	4.8	0.2[b]	0.2[b]	0.2[b]	22
Pecos	1.0[b]	5.8	150	1.50	0.2[b]	11.0	31.0	0.005[b]	20.0	20.0	0.2[b]	0.7	0.2[b]	100

[a] Trace elements were digested using EPA method 3051 and analyzed using EPA method 6020 (Sb, Tl, Pb), 7000A (As, Se), 7471A (Hg) and 6010B (all others).

[b] All less-than values were converted to one-half the concentration.

Table 6-8. Organic Compound Concentrations in Garden Tilled Surface (0- to 6-inch depth) Soils Collected from Regional Organic Farming Locations in Northern New Mexico after the Cerro Grande Fire

Location	PEST[a]	PCBs[b]	HE[c]	Dioxins[d]	PAHs[e]
Soils from Tilled Organic Farming Areas Directly Downwind of the Cerro Grande Fire					
Ojo Sarco	ND[f]	ND	ND	OCDD (19.1 pg/g)	ND
Embudo	ND	ND	ND	OCDD (13.6 pg/g)	ND
Española	ND	ND	ND	OCDD (11.9 pg/g)	ND
Abiquiu	4,4-DDE (63 ng/g)	ND	ND	OCDD (22.4 pg/g)	ND
Soils from Tilled Organic Farming Areas Not Directly Downwind of the Cerro Grande Fire (Control)					
Cochiti	ND	ND	ND	OCDD (12.0 pg/g)	ND
Pecos	4,4-DDE (21 ng/g)	ND	ND	OCDD (9.9 pg/g)	ND

[a] PEST = Pesticides (Alpha-BHC, Gamma-BHC [Lindane], Heptachlor, Aldrin, Beta-BHC, Delta-BHC, Heptachlor Epoxide, Endosulfan I, Gamma-Chloradane, Alpha-Chloradane, 4,4-DDE, Dieldrin, Endrin, 4,4-DDD, Endosulfan II, 4,4-DDT, Endrin Aldehyde, Methoxychlor, Endosulfan Sulfate, Endrin Ketone, Toxaphene).
[b] PCBs = Polychlorinated byphenals (Aroclor-1016, Aroclor-1221, Aroclor-1232, Aroclor-1242, Aroclor-1248, Aroclor-1254, Aroclor-1260).
[c] HE = High explosives (HMX, RDX, 1,3,5-Trinitrobenzene, 1,3-Dinitrobenzene, Tetryl, Nitrobenzene, 2,4,6-Trinitrotoluene, 4-Amino-2,6-DNT, 4-Amino-4,6-DNT, 2,6-Dinitrotoluene, 2,4-Dinitrotoluene, 2-Nitrotoluene, 4-Nitrotoluene, 3-Nitrotoluene).
[d] Dioxin and dioxin-like compounds (2,3,7,8-Tetrachlorodibenzo-p-dioxin [TCDD], 1,2,3,7,8-Pentachlorodibenzo-p-dioxin [PeCDD], 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin [HxCDD], 1,2,3,4,7,8- Hexachlorodibenzo-p-dioxin [HxCDD], 1,2,3,7,8,9- Hexachlorodibenzo-p-dioxin [HxCDD], 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin [HpCDD], 1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin [OCDD]).
[e] PAH = Polynuclear aromatic hydrocarbons (Naphathalene, Acenaphthylene, 1-Methylnaphthalene, 2-Methylnaphthalene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenzo(a,h)anthrancene, Benzo(g,h,I)perylene, Indeno(1,2,3-cd)pyrene).
[f] ND = Not detected above reporting limits.

Table 6-9. Radionuclide Concentrations in Surface Soils Collected from Area G in 2000[a]

	Radionuclide						
Location	^{3}H (pCi/mL)[b]	^{241}Am (pCi/g dry)	^{137}Cs (pCi/g dry)	^{238}Pu (pCi/g dry)	^{239,240}Pu (pCi/g dry)	^{90}Sr (pCi/g dry)	^{tot}U (µg/g dry)
1[c]	254.50 (8.40)	0.012 (0.004)	0.29 (0.05)	0.004 (0.001)	0.027 (0.003)	0.17 (0.05)	2.53 (0.25)
2	206.30 (7.00)	0.017 (0.004)	0.74 (0.10)	0.008 (0.002)	0.050 (0.004)	0.15 (0.05)	2.65 (0.27)
3	2.37 (0.60)	0.022 (0.006)	0.12 (0.03)	0.006 (0.002)	0.046 (0.004)	0.08 (0.05)	1.72 (0.17)
3b	1.02 (0.49)	0.006 (0.002)	0.29 (0.04)	0.004 (0.001)	0.026 (0.003)	0.00 (0.04)	2.67 (0.27)
4	0.68 (0.52)	2.034 (0.055)	0.30 (0.04)	0.390 (0.013)	17.595 (0.472)	0.24 (0.05)	2.74 (0.27)
5	506.00 (15.00)	0.068 (0.010)	0.00 (0.18)	0.012 (0.002)	0.424 (0.017)	0.02 (0.05)	1.74 (0.17)
6b	0.57 (0.44)	0.256 (0.015)	0.28 (0.04)	0.033 (0.003)	0.947 (0.033)	0.17 (0.05)	2.64 (0.26)
7a	14.70 (1.30)	0.023 (0.007)	0.07 (0.04)	0.044 (0.004)	0.073 (0.005)	0.07 (0.04)	3.11 (0.31)
7b	6.52 (0.87)	0.002 (0.001)	–0.01 (0.05)	0.015 (0.002)	0.055 (0.004)	0.04 (0.05)	3.06 (0.31)
7c	1.92 (0.57)	0.125 (0.012)	0.47 (0.06)	0.149 (0.008)	1.116 (0.040)	0.17 (0.05)	2.50 (.025)
8	0.30 (0.42)	0.024 (0.004)	0.03 (0.03)	0.038 (0.003)	0.149 (0.008)	0.08 (0.06)	3.45 (0.35)
G-29-03	3,422.00 (94.00)	0.006 (0.002)	0.19 (0.04)	0.003 (0.001)	0.013 (0.002)	0.02 (0.05)	0.22 (0.02)
G-31-01	275.90 (9.00)	0.022 (0.004)	0.69 (0.09)	0.006 (0.002)	0.082 (0.006)	0.43 (0.06)	3.01 (0.30)
G-41-02	0.44 (0.50)	0.177 (0.009)	0.45 (0.06)	5.224 (0.139)	1.004 (0.029)	0.21 (0.05)	3.96 (0.40)
G-43-01	0.65 (0.52)	0.079 (0.005)	0.30 (0.04)	0.190 (0.008)	0.295 (0.011)	0.46 (0.06)	2.86 (0.29)
G-48-02	2.10 (0.58)	0.176 (0.012)	0.29 (0.05)	0.134 (0.007)	1.003 (0.035)	0.20 (0.05)	2.61 (0.26)
G-58-01	1.02 (0.49)	–0.000 (0.002)	0.07 (0.03)	0.004 (0.001)	0.008 (0.002)	0.20 (0.06)	1.32 (0.13)
RBG[d]	0.08 (0.12)	0.007 (0.005)	0.21 (0.17)	0.001 (0.001)	0.010 (0.008)	0.19 (0.11)	2.06 (0.56)
RSRL[e]	0.60	0.013	0.51	0.008	0.019	0.71	3.30
SAL[f]	6,400.0	39.0	5.3	49.0	44.0	5.7	100.0

[a] See Figure 6-2 for sample location points.
[b] Concentration for ^{3}H is based on soil moisture: a value of 6400 is equivalent to a value of 880 pCi/g ^{3}H for a soil at a water content of 12%.
[c] Samples without a G prefix collected at the 0- to 2-inch depth; samples with a G prefix collected at the 0- to 6-inch depth.
[d] Regional Background is the background concentration for samples from Embudo, Cochiti, and Jemez in 2000 (Table 6-1).
[e] Regional statistical reference level; this is the upper-level background concentrations (mean + 2 std dev) from 1995–1999.
[f] Screening Action Level (ER 2000).

Table 6-10. Radionuclide Concentrations in Surface Soils and Sediments Collected Around the DARHT Facility in 2000[a]

Location	^{3}H (pCi/mL)	^{90}Sr (pCi/g dry)	^{tot}U (µg/g dry)	^{137}Cs (pCi/g dry)	^{238}Pu (pCi/g dry)	^{239,240}Pu (pCi/g dry)	^{241}Am (pCi/g dry)
Soil							
North	–0.09 (0.45)[b,c]	0.06 (0.05)	3.94 (0.39)	0.13 (0.04)	0.002 (0.001)	0.005 (0.001)	0.001 (0.000)
East	–0.16 (0.44)	0.24 (0.05)	8.28 (0.83)	0.49 (0.06)	0.001 (0.000)	0.023 (0.002)	0.012 (0.003)
South	–0.07 (0.45)	0.24 (0.05)	6.80 (0.68)	0.29 (0.05)	0.002 (0.001)	0.019 (0.002)	0.012 (0.004)
West	–0.21 (0.44)	0.11 (0.05)	4.31 (0.43)	0.17 (0.03)	0.001 (0.001)	0.007 (0.001)	0.000 (0.000)
Mean (SD)	–0.13 (0.06)	0.16 (0.09)	5.83 (2.07)	0.27 (0.16)	0.002 (0.001)	0.014 (0.008)	0.006 (0.006)
Sediment							
North	0.12 (0.47)	0.09 (0.05)	5.93 (0.59)	0.18 (0.04)	0.001 (0.001)	0.006 (0.001)	0.003 (0.002)
East	–0.17 (0.44)	0.09 (0.05)	6.34 (0.63)	0.27 (0.05)	0.021 (0.002)	0.054 (0.004)	0.005 (0.001)
South	0.06 (0.46)	0.13 (0.05)	7.83 (0.78)	0.61 (0.08)	0.002 (0.001)	0.019 (0.002)	0.004 (0.002)
South West	–0.16 (0.44)	0.17 (0.05)	7.68 (0.77)	0.25 (0.04)	0.002 (0.001)	0.028 (0.003)	0.000 (0.000)
Mean (SD)	–0.04 (0.15)	0.12 (0.04)	6.95 (0.95)	0.33 (0.19)	0.007 (0.009)	0.027 (0.02)	0.003 (0.002)
RBG[b]	0.08 (0.12)	0.19 (0.11)	2.06 (0.56)	0.21 (0.17)	0.001 (0.001)	0.010 (0.008)	0.007 (0.005)
Soil BSRL[c]	0.53	0.34	6.50	0.27	0.003	0.017	0.008
Sediment BSRL	0.90	0.26	9.99	0.51	0.005	0.026	0.015
SAL[d]	6,400.00	5.70	100.0	5.30	49.0	44.0	39.0

[a] See Figure 6-3 for locations of sampling sites.
[b] Regional Background is the background concentration for samples from Embudo, Cochiti, and Jemez in 2000 (Table 6-1).
[c] Baseline Statistical Reference Level (Fresquez et al., 2001).
[d] Screening Action Level (ER 2001).

Table 6-11. Trace Element Concentrations (μg/g dry) in Surface Soils and Sediments Collected Around the DARHT Facility in 2000[a]

Location	Ag	As	Ba	Be	Cd	Cr	Cu	Hg	Ni	Pb	Sb	Se	Tl
Soil													
North	1.0[b]	3.00	140.0	1.00	0.20[b]	14.0	5.2	0.01	7.1	10.3	0.02[b]	0.2[b]	0.2
East	1.0[b]	3.00	84.0	0.70	0.20[b]	8.3	5.8	0.01	1.0[b]	12.8	0.02[b]	0.9	0.1
South	1.0[b]	1.00	110.0	0.83	0.20[b]	6.3	5.1	0.005[b]	2.5	13.7	0.02[b]	0.2[b]	0.1
West	1.0[b]	1.60	110.0	0.78	0.20[b]	7.3	4.5	0.005[b]	6.0	9.8	0.02[b]	0.2[b]	0.1
Mean	1.0	2.15	111.0	0.83	0.20	8.9	5.2	0.008	4.2	11.7	0.02	0.4	0.1
(SD)	(0.0)	(1.01)	(22.9)	(0.13)	(0.00)	(3.5)	(0.5)	(.003)	(2.9)	(1.9)	(0.0)	0.4)	(0.1)
Sediment													
North	1.0[b]	2.1	80.0	0.56	0.20[b]	7.7	4.4	0.005[b]	4.5	35.0	0.1[b]	0.2[b]	0.2
East	1.0[b]	2.3	97.0	0.64	0.20[b]	7.8	4.8	0.015	2.5	14.0	0.1[b]	0.4	0.2
South	1.0[b]	1.1	77.0	0.62	0.20[b]	6.1	3.8	0.005[b]	1.0[b]	27.0	0.1[b]	0.2[b]	0.2
South West	1.0[b]	1.0	77.0	0.58	0.20[b]	6.8	5.3	0.012	2.5	25.0	0.1[b]	0.2[b]	0.1[b]
Mean	1.0	1.6	82.8	0.60	0.2	7.1	4.6	0.009	2.6	25.3	0.1	0.3	0.2
(SD)	(0.0)	(0.7)	(9.6)	(0.04)	(0.0)	(0.8)	(0.6)	(0.005)	(1.4)	(8.7)	(0.0)	(0.1)	(0.05)
RBG[c]	1.00	2.30	130	0.58	0.20	10.0	4.1	0.01	6.90	9.0[b]	0.10	0.60	0.10
Soil BSRL[e]	1.62	3.16	147	1.08	0.52	14.4	7.02	0.04	9.62	13.5	0.40	0.55	0.40
Sediment BSRL[e]	1.56	3.48	161	1.19	0.55	12.0	7.90	0.04	9.45	15.4	0.38	0.43	0.30
SAL[f]	390	6.1	5,400	150.0	39.0	210	2,900	23.0	1,600	400	31.0	390	5.5

[a] See Figure 6-3 for locations of sampling sites.
[b] Less than values are reported as one-half the detection limit.
[c] BG is the mean background concentration for samples from Embudo, Cochiti, and Jemez in 2000 (Table 6-4).
[d] NA = no analysis.
[e] Baseline Statistical Reference Level (Fresquez et al., 2001).
[f] Screening Action Level (EPA 2000).

Table 6-12. Radionuclide Concentrations in Produce Collected from Regional Background, Perimeter, and On-Site Locations during the 2000 Growing Season (after fire)[a]

Location	^{3}H (pCi/mL)	^{137}Cs (10^{-3} pCi/g dry)	^{90}Sr (10^{-3} pCi/g dry)	^{tot}U (ng/g dry)	^{238}Pu (10^{-5} pCi/g dry)	^{239}Pu (10^{-5} pCi/g dry)	^{241}Am (10^{-5} pCi/g dry)
Regional Background Stations							
Abiquiu (A)/Arroyo Seco (AS)/Embudo (E)/Española Valley (EV)/La Puebla (LP)/Ojo Sarco (OS):							
Apple (EV)	0.27 (0.15)[b]	–2.16 (8.5)[c]	1.08 (0.36)	1.37 (0.49)	–2.9 (10.1)	15.8 (12.2)	36.0 (23.4)
Apricot (EV)	0.24 (0.15)	21.32 (27.9)	3.28 (0.82)	7.22 (2.22)	68.9 (52.5)	124.6 (54.9)	109.9 (54.1)
Beet (OS)	–0.16 (0.15)	–2.64 (11.7)	15.40 (1.76)	4.84 (1.28)	30.8 (24.2)	17.6 (24.2)	48.8 (20.7)
Broccoli Rabe (OS)	0.40 (0.15)	11.97 (11.3)	[d]	31.12 (4.39)	58.5 (39.2)	13.3 (30.6)	53.2 (29.9)
Buckwheat (E)	0.32 (0.15)	2.04 (6.1)	35.70 (3.57)	[d]	23.5 (29.6)	39.8 (27.5)	102.0 (46.4)
Cherry (EV)	–0.40 (0.15)	–1.96 (16.2)	0.00 (0.49)	3.33 (1.37)	[d]	16.7 (21.6)	[d]
Chile (EV)	–0.08 (0.15)	–32.12 (35.8)	10.22 (1.83)	4.96 (1.79)	34.3 (30.3)	48.2 (23.7)	65.7 (40.2)
Corn (EV)	0.12 (0.15)	10.88 (14.7)	3.20 (0.64)	1.09 (0.61)	35.8 (21.8)	19.8 (17.6)	65.9 (24.6)
Cucumber (LP)	0.11 (0.15)	–3.99 (15.3)	58.52 (5.32)	8.65 (2.13)	–7.9 (26.6)	38.6 (27.3)	125.0 (61.9)
Lettuce (A)	0.05 (0.15)	5.00 (41.3)	[d]	27.75 (5.13)	80.0 (72.5)	160.0 (101.3)	185.0 (75.0)
Peach (AS)	0.10 (0.15)	–0.76 (15.2)	3.80 (0.38)	4.94 (1.33)	–19.0 (17.1)	24.3 (17.1)	–25.8 (17.8)
Plum (OS)	0.35 (0.15)	–13.53 (20.3)	1.23 (0.62)	4.06 (1.42)	22.1 (42.4)	28.3 (38.1)	20.9 (39.4)
Ruby Chard (OS)	0.38 (0.16)	–7.02 (13.7)	6.24 (0.78)	2.42 (0.94)	33.5 (22.6)	7.8 (17.6)	11.7 (26.1)
Squash (EV)	0.32 (0.16)	7.86 (22.9)	7.86 (0.66)	6.81 (2.03)	55.0 (59.6)	10.5 (43.9)	144.1 (78.6)
Squash (EV)	0.12 (0.15)	–17.03 (42.6)	17.03 (1.97)	13.36 (2.88)	–5.2 (26.9)	19.7 (26.9)	–5.2 (54.4)
Sweet Pea (A)	0.20 (0.15)	0.00 (15.2)	42.90 (3.90)	6.79 (1.60)	3.1 (32.4)	42.1 (39.0)	43.7 (23.8)
Tomato (LP)	0.03 (0.15)	–3.00 (18.0)	4.00 (0.50)	2.80 (1.25)	9.0 (20.5)	–13.0 (20.5)	0.0 (55.0)
Winter Wheat (E)	0.00 (0.15)	0.60 (3.4)	2.80 (0.30)	1.72 (0.38)	8.2 (7.5)	–3.8 (4.2)	15.6 (6.3)
Mean (std dev)	0.13 (0.21)	–0.78 (12.7)	13.33 (17.30)	7.84 (8.70)	25.2 (28.5)	33.9 (42.8)	58.6 (57.7)
RSRL[e]	0.55	88.50	136.4	26.8	30.0	41.2	70.3

Table 6-12. Radionuclide Concentrations in Produce Collected from Regional Background, Perimeter, and On-Site Locations during the 2000 Growing Season (after fire)[a] (Cont.)

Location	^{3}H (pCi/mL)	^{137}Cs (10^{-3} pCi/g dry)	^{90}Sr (10^{-3} pCi/g dry)	^{tot}U (ng/g dry)	^{238}Pu (10^{-5} pCi/g dry)	^{239}Pu (10^{-5} pCi/g dry)	^{241}Am (10^{-5} pCi/g dry)
Perimeter Stations							
Los Alamos:							
Apple	0.28 (0.15)	0.00 (18.0)	8.64 (1.08)	2.05 (0.88)	46.8 (19.8)	4.3 (13.3)	61.2 (28.8)
Apricot	0.40 (0.16)	6.56 (27.9)	16.40 (1.64)	10.66 (2.95)	–22.9 (60.7)	131.2 (90.2)	101.7 (65.6)
Cherry	0.23 (0.15)	17.64 (16.2)	5.88 (0.49)	4.02 (1.37)	–34.3 (27.4)	–5.9 (27.4)	84.3 (45.7)
Crab Apple	0.33 (0.15)	–14.40 (8.8)	7.60 (0.80)	1.16 (0.60)	14.0 (14.4)	29.6 (17.0)	52.0 (24.0)
Peach	0.22 (0.15)	–3.80 (20.9)	9.88 (1.14)	4.10 (1.22)	34.2 (28.5)	28.1 (28.9)	129.2 (49.4)
Plum	0.46 (0.16)	–3.69 (20.9)	13.53 (1.85)	3.32 (1.48)	–12.3 (43.1)	33.2 (30.1)	41.8 (33.8)
Squash	0.15 (0.15)	26.20 (21.0)	9.17 (1.97)	2.62 (1.31)	157.2 (85.2)	65.5 (55.7)	128.4 (58.3)
Mean (std dev)	0.30 (0.11)*	4.07 (13.9)	10.16 (3.62)	3.99 (3.13)	26.1 (65.0)	40.9 (45.9)	85.5 (36.7)
White Rock (WR)/Pajarito Acres (PA):							
Apricot (WR)	0.18 (0.15)	9.84 (27.1)	8.20 (1.64)	12.14 (2.95)	147.6 (82.0)	29.5 (56.6)	44.3 (32.8)
Cherry (WR)	0.38 (0.16)	3.92 (15.7)	1.96 (0.98)	1.18 (0.69)	17.6 (24.5)	0.0 (22.1)	7.8 (20.1)
Chile (PA)	0.43 (0.16)	–10.95 (24.5)	5.84 (1.10)	1.46 (0.99)	32.1 (26.7)	7.3 (25.2)	79.6 (25.2)
Green Bean (PA)	0.22 (0.15)	[d]	21.06 (2.34)	4.13 (1.41)	21.1 (28.9)	42.1 (29.6)	53.0 (21.5)
Lettuce (PA)	0.18 (0.15)	7.50 (112.5)	65.00 (7.50)	31.50 (6.88)	–62.5 (92.5)	115.0 (97.5)	185.0 (75.0)
Rhubard (PA)	0.14 (0.15)	–2.34 (12.9)	31.98 (3.12)	4.29 (1.17)	11.7 (22.2)	0.0 (22.2)	44.5 (23.0)
Tomato (PA)	0.16 (0.15)	–4.00 (19.0)	6.00 (1.00)	2.80 (1.25)	–20.0 (31.0)	2.0 (30.5)	0.0 (50.0)
Mean (std dev)	0.24 (0.12)	0.66 (7.8)	20.00 (22.48)	8.21 (10.91)	21.1 (64.4)	28.0 (41.7)	59.2 (61.7)
Cochiti (C)/Peña Blanca (PB)/ Sile (S):							
Apricot (PB)	0.44 (0.16)	21.32 (28.7)	4.92 (0.82)	7.05 (2.38)	36.1 (45.1)	90.2 (51.7)	86.9 (77.1)
Cabbage (S)	0.36 (0.15)	15.00 (70.0)	47.50 (5.00)	5.00 (3.13)	–17.5 (75.0)	132.5 (96.3)	[d]
Cherry (C)	0.35 (0.15)	0.98 (26.5)	6.86 (0.98)	5.78 (1.62)	2.9 (22.1)	2.9 (22.1)	11.8 (37.2)
Chile (S)	0.13 (0.15)	–2.92 (12.1)	1.46 (1.10)	1.68 (0.88)	12.4 (24.5)	18.3 (24.5)	[d]
Lettuce (S)	0.32 (0.15)	10.00 (48.8)	50.00 (5.00)	89.75 (11.13)	–52.5 (90.0)	200.0 (113.8)	300.0 (137.5)
Nectarine (S)	0.11 (0.15)	–2.34 (14.4)	2.34 (0.39)	2.73 (1.56)	117.0 (46.8)	1.6 (21.5)	[d]
Peach (S)	0.01 (0.15)	–3.80 (11.4)	1.52 (0.38)	3.12 (1.26)	1.5 (23.9)	29.6 (25.1)	22.0 (19.8)
Tomato (S)	0.30 (0.15)	10.00 (17.0)	2.00 (0.50)	1.50 (1.25)	112.0 (50.0)	22.0 (30.5)	[d]
Mean (std dev)	0.25 (0.15)	6.03 (9.4)	14.58 (21.19)	14.58 (30.44)	26.5 (59.9)	62.1 (72.2)	105.2 (134.1)

Table 6-12. Radionuclide Concentrations in Produce Collected from Regional Background, Perimeter, and On-Site Locations during the 2000 Growing Season (after fire)[a] (Cont.)

Location	^{3}H (pCi/mL)	^{137}Cs (10^{-3} pCi/g dry)	^{90}Sr (10^{-3} pCi/g dry)	^{tot}U (ng/g dry)	^{238}Pu (10^{-5} pCi/g dry)	^{239}Pu (10^{-5} pCi/g dry)	^{241}Am (10^{-5} pCi/g dry)
Perimeter Stations (Cont.)							
San Ildefonso (SI)/El Rancho (ER):							
Apple (SI)	0.29 (0.15)	–2.16 (11.5)	0.72 (0.54)	1.91 (0.65)	26.3 (16.2)	0.0 (9.4)	23.0 (8.1)
Apricot (ER)	0.27 (0.15)	–1.64 (25.4)	6.56 (0.82)	5.90 (2.22)	–1.6 (41.0)	90.2 (51.7)	14.8 (42.6)
Corn (SI)	0.35 (0.15)	4.48 (13.8)	2.56 (0.64)	1.98 (0.83)	52.5 (28.8)	14.1 (19.5)	25.6 (21.4)
Peach (SI)	0.39 (0.15)	3.80 (9.9)	6.84 (0.76)	7.45 (1.71)	–6.1 (18.6)	13.7 (18.6)	57.0 (33.4)
Squash (SI)	0.32 (0.15)	–1.31 (28.2)	31.44 (3.28)	4.72 (1.71)	95.6 (50.4)	58.9 (38.7)	91.7 (40.6)
Mean (std dev)	0.32 (0.05)*	0.63 (3.2)	9.62 (12.47)	4.39 (2.43)	33.3 (42.1)	35.4 (37.9)	42.4 (31.9)
On-Site Stations							
LANL (Mesa):							
Apple (TA-52)	0.58 (0.16)	1.44 (6.1)	2.16 (0.36)	1.08 (0.42)	–2.2 (7.2)	5.4 (7.2)	28.8 (17.1)
Apricot (TA-35)	1.14 (0.18)	3.28 (28.7)	29.52 (2.46)	3.44 (1.64)	47.6 (41.8)	37.7 (42.6)	13.1 (40.2)
Nectarine (TA-3)	0.28 (0.15)	2.34 (6.6)	1.56 (0.39)	1.48 (0.86)	–8.6 (28.1)	36.7 (23.8)	–14.8 (24.5)
Peach (TA-3)	0.44 (0.16)	–9.12 (11.4)	2.28 (0.38)	0.91 (0.84)	72.9 (34.2)	–5.3 (18.6)	41.8 (30.2)
Peach (TA-35)	5.50 (0.40)	–0.76 (12.2)	9.12 (0.76)	2.74 (1.07)	22.8 (19.0)	12.2 (15.9)	–3.8 (32.7)
Mean (std dev)	1.59 (2.21)*	–0.56 (5.0)	8.93 (11.92)	1.93 (1.11)	26.5 (34.2)	17.3 (19.2)	13.0 (23.1)

Table 6-12. Radionuclide Concentrations in Produce Collected from Regional Background, Perimeter, and On-Site Locations during the 2000 Growing Season (after fire)[a] (Cont.)

Location	^{234}U (10^{-3} pCi/g dry)		^{235}U (10^{-4} pCi/g dry)		^{238}U (10^{-3} pCi/g dry)	
Regional Background Stations						
Abiquiu (A)/Arroyo Seco (AS)/Embudo (E)/Española Valley (EV)/La Puebla (LP)/Ojo Sarco (OS):						
Apple (EV)	0.49	(0.17)	0.86	(0.87)	0.44	(0.15)
Apricot (EV)	2.48	(0.72)	2.13	(3.45)	2.41	(0.70)
Beet (OS)	1.32	(0.40)	3.17	(1.96)	1.58	(0.40)
Broccoli Rabe (OS)	15.69	(1.86)	15.16	(5.79)	10.24	(1.40)
Buckwheat (E)	d		d		d	
Cherry (EV)	0.68	(0.44)	2.94	(2.84)	1.09	(0.41)
Chile (EV)	2.41	(0.66)	–0.29	(3.25)	1.68	(0.55)
Corn (EV)	0.63	(0.24)	1.28	(1.38)	0.35	(0.19)
Cucumber (LP)	5.05	(0.87)	6.78	(3.66)	2.79	(0.67)
Lettuce (A)	14.25	(2.13)	3.25	(5.25)	9.25	(1.63)
Peach (AS)	2.81	(0.57)	3.50	(2.17)	1.60	(0.42)
Plum (OS)	1.40	(0.54)	–1.11	(1.97)	1.40	(0.45)
Ruby Chard (OS)	2.65	(0.51)	–0.62	(2.11)	0.81	(0.28)
Squash (EV)	3.93	(0.92)	3.01	(2.23)	2.36	(0.66)
Squash (EV)	5.90	(1.12)	2.36	(3.41)	4.45	(0.92)
Sweet Pea (A)	4.13	(0.67)	1.95	(2.26)	2.26	(0.51)
Tomato (LP)	1.60	(0.60)	3.60	(2.80)	0.88	(0.38)
Winter Wheat (E)	0.84	(0.15)	1.24	(0.59)	0.56	(0.12)
Mean (std dev)	3.90	(4.46)	2.90	(3.68)	2.60	(2.88)
RSRL[e]	6.5		2.6		5.6	

Table 6-12. Radionuclide Concentrations in Produce Collected from Regional Background, Perimeter, and On-Site Locations during the 2000 Growing Season (after fire)[a] (Cont.)

Location	^{234}U (10^{-3} pCi/g dry)		^{235}U (10^{-4} pCi/g dry)		^{238}U (10^{-3} pCi/g dry)	
Perimeter Stations						
Los Alamos:						
Apple	0.68	(0.31)	0.50	(1.73)	0.68	(0.27)
Apricot	2.13	(0.82)	9.68	(5.17)	3.44	(0.90)
Cherry	0.91	(0.41)	2.35	(2.40)	1.32	(0.42)
Crab Apple	0.72	(0.24)	0.52	(1.22)	0.38	(0.19)
Peach	1.60	(0.46)	0.84	(1.67)	1.37	(0.38)
Plum	1.85	(0.62)	3.81	(2.83)	1.07	(0.46)
Squash	0.26	(0.53)	10.09	(4.06)	0.73	(0.38)
Mean (std dev)	1.16	(0.70)	3.97	(4.21)	1.28	(1.02)
White Rock (WR)/Pajarito Acres (PA):						
Apricot (WR)	3.61	(0.90)	18.37	(6.48)	3.77	(0.90)
Cherry (WR)	1.60	(0.38)	1.18	(1.23)	0.39	(0.21)
Chile (PA)	0.80	(0.40)	4.09	(2.56)	0.42	(0.30)
Green Bean (PA)	2.96	(0.63)	4.76	(2.97)	1.33	(0.43)
Lettuce (PA)	11.50	(2.38)	20.00	(10.75)	10.25	(2.13)
Rhubard (PA)	2.18	(0.47)	2.65	(2.03)	1.41	(0.37)
Tomato (PA)	1.70	(0.60)	3.60	(2.75)	0.87	(0.38)
Mean (std dev)	3.48	(3.66)	7.81	(7.87)	2.63	(3.55)
Cochiti (C)/Peña Blanca (PB)/ Sile (S):						
Apricot (PB)	3.12	(0.90)	4.26	(4.35)	2.31	(0.73)
Cabbage (S)	2.83	(1.14)	–6.75	(5.63)	1.78	(0.97)
Cherry (C)	1.37	(0.47)	6.86	(3.29)	1.85	(0.49)
Chile (S)	1.24	(0.44)	4.89	(2.52)	0.49	(0.25)
Lettuce (S)	38.75	(4.25)	10.25	(8.88)	30.00	(3.63)
Nectarine (S)	1.09	(0.47)	8.27	(3.47)	0.78	(0.47)
Peach (S)	1.90	(0.50)	6.08	(3.80)	0.94	(0.36)
Tomato (S)	0.70	(0.50)	8.60	(3.50)	0.37	(0.36)
Mean (std dev)	6.38	(13.11)	5.31	(5.26)	4.82	(10.20)

Table 6-12. Radionuclide Concentrations in Produce Collected from Regional Background, Perimeter, and On-Site Locations during the 2000 Growing Season (after fire)[a] (Cont.)

Location	^{234}U (10^{-3} pCi/g dry)	^{235}U (10^{-4} pCi/g dry)	^{238}U (10^{-3} pCi/g dry)
Perimeter Stations (Cont.)			
San Ildefonso (SI)/El Rancho (ER):			
Apple (SI)	1.12 (0.25)	2.27 (1.17)	0.61 (0.20)
Apricot (ER)	2.13 (0.73)	–5.58 (3.20)	2.07 (0.71)
Corn (SI)	1.41 (0.38)	–1.79 (1.35)	0.69 (0.26)
Peach (SI)	2.43 (0.61)	4.71 (2.93)	2.43 (0.53)
Squash (SI)	2.49 (0.72)	9.56 (4.13)	1.43 (0.51)
Mean (std dev)	1.92 (0.62)	1.83 (5.84)	1.45 (0.81)
On-Site Stations			
LANL (Mesa):			
Apple (TA-52)	0.31 (0.15)	1.33 (1.01)	0.35 (0.13)
Apricot (TA-35)	1.72 (0.65)	8.86 (3.94)	1.03 (0.20)
Nectarine (TA-3)	0.76 (0.30)	0.39 (1.37)	0.49 (0.26)
Peach (TA-3)	0.72 (0.29)	2.20 (1.67)	0.27 (0.26)
Peach (TA-35)	0.54 (0.36)	0.53 (1.86)	0.92 (0.33)
Mean (std dev)	0.81 (0.54)	2.66 (3.54)	0.61 (0.34)

[a] There are no concentration guides for produce, and, with the exception of tritium, there were no statistical differences in any of the mean values from perimeter and on-site locations when compared with regional background at the 0.05 probability level using a Wilcoxon Rank Sum Test. Means followed by an * were statistically higher than regional background.

[b] (±1 counting uncertainty); values are the uncertainty of the analytical results at the 65% confidence level.

[c] See Appendix B for an explanation of the presence of negative values.

[d] Sample lost in analysis, not analyzed, or outlier omitted. An outlier was omitted when the result was greater than three standard deviations of the mean (99% confidence level).

[e] Regional Statistical Reference Level; this is the upper-limit background concentration (mean + 2 std dev) based on data from 1994 to 1999.

Table 6-13. Mean (±SD) Radionuclide Concentrations in Produce Collected from Regional Background, Perimeter, and On-Site Locations Before (1999) and After (2000) the Cerro Grande Fire

Location/Date	^{3}H (pCi/mL)	^{137}Cs (10^{-3} pCi/g dry)	^{90}Sr (10^{-3} pCi/g dry)	^{tot}U (ng/g dry)	^{238}Pu (10^{-5} pCi/g dry)	^{239}Pu (10^{-5} pCi/g dry)	^{241}Am (10^{-5} pCi/g dry)
Regional Background Stations							
Abiquiu/Arroyo Seco/Embudo/Española Valley/La Puebla/Ojo Sarco:							
1999[a]	–0.03 (0.22)	8.49 (7.0)*[b]	175.2 (169.4)*	11.0 (10.1)	–17.1 (30.6)	4.1 (26.6)	–8.17 (15.0)
2000	0.13 (0.21)	–0.78 (12.7)	13.3 (17.3)	7.8 (8.7)	25.2 (28.5)*	33.9 (42.8)*	58.62 (57.7)*
Perimeter Stations							
Los Alamos:							
1999[a]	0.19 (0.36)	4.50 (6.6)	25.8 (59.5)	1.8 (1.3)	75.2 (50.0)	5.2 (16.8)	–5.01 (7.4)
2000	0.30 (0.11)	4.07 (13.9)	10.2 (3.6)	4.0 (3.1)	26.1 (65.0)	40.8 (45.9)	85.51 (36.7)*
White Rock (WR)/Pajarito Acres (PA):							
1999[a]	–0.03 (0.26)	17.19 (13.7)*	144.2 (87.6)*	2.3 (2.5)	133.3 (153.1)	2.0 (9.9)	0.55 (6.7)
2000	0.24 (0.12)*	0.66 (7.8)	20.0 (22.5)	8.2 (10.9)	21.1 (64.4)	28.0 (41.7)	59.17 (61.7)*
Cochiti/Peña Blanca/Sile:							
1999[a]	0.04 (0.29)	13.21 (15.3)	53.7 (31.5)*	2.0 (2.8)	97.4 (118.4)	–12.5 (18.6)	–6.14 (10.7)
2000	0.25 (0.15)	6.03 (9.4)	14.6 (21.2)	14.6 (30.4)	26.5 (59.9)	62.1 (72.2)*	105.18 (134.1)*
San Ildefonso/El Rancho:							
1999[a]	–0.12 (0.31)	–3.29 (20.5)	64.9 (69.6)	14.9 (13.6)	57.7 (73.6)	–11.9 (9.8)	–16.12 (14.0)
2000	0.32 (0.05)*	0.63 (3.2)	9.6 (12.5)	4.4 (2.4)	33.3 (42.1)	35.4 (37.9)*	42.42 (31.9)*
On-Site Stations							
LANL (Mesa):							
1999[a]	1.49 (1.11)	7.34 (7.3)	20.4 (15.2)	1.2 (0.8)	7.8 (12.9)	9.6 (7.3)	2.89 (6.4)
2000	1.59 (2.21)	–0.56 (5.0)	8.9 (11.9)	1.9 (1.1)	26.5 (34.2)	17.3 (19.2)	13.02 (23.1)

Table 6-13. Mean (±SD) Radionuclide Concentrations in Produce Collected from Regional Background, Perimeter, and On-Site Locations Before (1999) and After (2000) the Cerro Grande Fire (Cont.)

Location/Date	^{234}U (10^{-3} pCi/g dry)	^{235}U (10^{-4} pCi/g dry)	^{238}U (10^{-3} pCi/g dry)
Regional Background Stations			
Abiquiu/Arroyo Seco/Embudo/Española Valley/La Puebla/Ojo Sarco:			
1999[a]	4.47 (3.24)	1.65 (1.86)	3.63 (3.35)
2000	3.90 (4.46)	2.90 (3.68)	2.60 (2.88)
Perimeter Stations			
Los Alamos:			
1999[a]	0.50 (0.61)	0.51 (1.06)	0.60 (0.43)
2000	1.16 (0.70)	3.97 (4.21)*	1.28 (1.02)
White Rock/Pajarito Acres:			
1999[a]	0.93 (0.81)	0.60 (1.50)	0.75 (0.82)
2000	3.48 (3.66)	7.81 (7.87)*	2.63 (3.55)
Cochiti/Peña Blanca/Sile: :			
1999[a]	0.60 (0.76)	–1.37 (1.25)	0.70 (0.90)
2000	6.38 (13.11)	5.31 (5.26)*	4.82 (10.20)
San Ildefonso/El Rancho:			
1999[a]	6.02 (5.91)	1.65 (1.95)	4.97 (4.50)
2000	1.92 (0.62)	1.83 (5.84)	1.45 (0.81)
On-Site Stations			
LANL (Mesa):			
1999[a]	0.52 (0.47)	–0.09 (0.45)	0.40 (0.27)
2000	0.81 (0.54)	2.66 (3.54)	0.61 (0.34)

[a] Fresquez and Gonzales (2000).

[b] Means within the same column and location followed by an * were statistically different from each other using a using a Wilcoxon Rank Sum Test at the 0.05 probability level.

Table 6-14. Total Recoverable Trace Element Concentrations (μg/g dry) in Produce Collected from Regional Background, Perimeter, and On-Site Locations during the 2000 Growing Season (after fire)[a]

Location	Ag	As	Ba	Be	Cd	Cr	Hg	Ni	Pb	Se	Tl	Zn
Regional Background Stations												
Abiquiu (A)/Arroyo Seco (AS)/Embudo (E)/Española Valley (EV)/La Puebla (LP)/Ojo Sarco (OS):												
Apple (EV)	1.0[b]	0.25[b]	2.40	0.10[b]	0.50[b]	0.50[b]	0.03[b]	2.0	1.7	0.20[b]	0.20[b]	1.9
Apricot (EV)	1.0[b]	0.25[b]	9.30	0.10[b]	0.50[b]	0.50[b]	0.03[b]	1.0[b]	2.7	0.20[b]	0.20[b]	7.2
Beet (OS)	1.0[b]	0.25[b]	63.50	0.10[b]	0.50[b]	0.50[b]	0.03[b]	11.0	6.5	0.40	0.20[b]	18.1
Broccoli Rabe (OS)	1.0[b]	0.25[b]	141.00	0.10[b]	0.50[b]	0.50[b]	0.03[b]	2.0	0.7	0.50	0.20[b]	34.3
Cherry (EV)	1.0[b]	0.25[b]	2.60	0.10[b]	0.50[b]	0.50[b]	0.03[b]	9.0	2.1	0.20[b]	0.20[b]	4.6
Chile (EV)	1.0[b]	0.25[b]	2.40	0.10[b]	0.50[b]	0.50[b]	0.03[b]	1.0[b]	1.5	0.40	0.20[b]	19.1
Corn (EV)	1.0[b]	0.25[b]	0.60	0.10[b]	0.50[b]	0.50[b]	0.03[b]	5.0	20.8	0.20[b]	0.20[b]	20.9
Cucumber (LP)	1.0[b]	0.25[b]	21.70	0.10[b]	0.50[b]	0.50[b]	0.03[b]	3.0	0.6	0.20[b]	0.20[b]	29.9
Lettuce (A)	1.0[b]	0.25[b]	15.30	0.10[b]	1.00	0.50[b]	0.03[b]	1.0[b]	2.8	0.60	0.20[b]	59.2
Peach (AS)	1.0[b]	0.25[b]	2.90	0.10[b]	0.50[b]	0.50[b]	0.03[b]	2.0	0.6	0.40	0.20[b]	5.4
Peas (A)	1.0[b]	0.25[b]	4.60	0.10[b]	0.50[b]	0.50[b]	0.03[b]	1.0[b]	1.5	0.50	0.20[b]	36.3
Plum (OS)	1.0[b]	0.25[b]	4.40	0.10[b]	0.50[b]	9.00	0.03[b]	49.0	2.0	1.00	0.20[b]	10.1
Ruby Chard (OS)	1.0[b]	0.25[b]	42.10	0.10[b]	0.50[b]	0.50[b]	0.03[b]	6.0	3.2	0.50	0.20[b]	32.9
Squash (Ev)	1.0[b]	0.25[b]	9.50	0.10[b]	0.50[b]	0.50[b]	0.03[b]	3.0	0.6	0.60	0.20[b]	52.2
Squash (EV)	1.0[b]	0.25[b]	5.20	0.10[b]	0.50[b]	0.50[b]	0.03[b]	3.0	2.1	0.20[b]	0.20[b]	24.7
Tomato (LP)	1.0[b]	0.03[b]	3.80	0.10[b]	0.50[b]	1.00	0.03[b]	47.0	14.4	0.20[b]	0.20[b]	19.1
Winter Wheat (E)	1.0[b]	0.25[b]	2.80	0.10[b]	0.50[b]	0.50[b]	0.03[b]	5.0	11.0	0.40	0.20[b]	40.3
Mean	1.0	0.25	19.65	0.10	0.53	1.03	0.03	8.9	4.4	0.39	0.20	24.5
(std dev)	(0.0)	(0.00)	(35.46)	(0.00)	(0.12)	(2.06)	(0.00)	(15.0)	(5.7)	(0.22)	(0.00)	(16.7)
RSRL[c]	1.3	0.57	19.49	0.45	0.65	1.56	0.06	21.9	15.9	0.63	0.27	22.3
Perimeter Stations												
Los Alamos:												
Apple	1.0[b]	0.25[b]	2.90	0.10[b]	0.50[b]	0.50[b]	0.03[b]	4.1	2.5	1.00	0.20[b]	4.2
Apricot	1.0[b]	0.25[b]	4.50	0.10[b]	0.50[b]	3.20	0.03[b]	91.0	35.0	1.00	0.20[b]	7.6
Cherry	1.0[b]	0.25[b]	2.70	0.10[b]	0.50[b]	2.70	0.03[b]	23.0	4.3	1.40	0.20[b]	4.9
Crab Apple	1.0[b]	0.25[b]	17.00	0.10[b]	0.50[b]	0.50[b]	0.03[b]	5.3	26.0	1.20	0.20[b]	5.7
Peach	1.0[b]	0.25[b]	2.00	0.10[b]	0.50[b]	0.50[b]	0.03[b]	1.0[b]	15.2	1.50	0.20[b]	9.1
Plum	1.0[b]	0.25[b]	2.30	0.10[b]	0.50[b]	3.30	0.03[b]	23.0	6.3	0.80	0.20[b]	4.6
Squash	1.0[b]	0.25[b]	5.20	0.10[b]	0.50[b]	0.50[b]	0.03[b]	3.1	5.4	1.40	0.20[b]	31.0
Mean	1.0	0.25	5.23	0.10	0.50	1.60	0.03	21.5	13.5	1.19	0.20	9.6
(std dev)	(0.0)	(0.00)	(5.32)	(0.00)	(0.00)	(1.38)	(0.00)	(32.0)	(12.5)	(0.26)*[d]	(0.00)	(9.6)

Table 6-14. Total Recoverable Trace Element Concentrations (μg/g dry) in Produce Collected from Regional Background, Perimeter, and On-Site Locations during the 2000 Growing Season (after fire)[a] (Cont.)

Location	Ag	As	Ba	Be	Cd	Cr	Hg	Ni	Pb	Se	Tl	Zn
Perimeter Stations (Cont.)												
White Rock (WR)/Pajarito Acres (PA):												
Apricot (WR)	1.0[b]	0.25[b]	6.70	0.10[b]	0.50[b]	1.80	0.03[b]	10.8	12.9	1.30	0.20[b]	6.8
Cherry (WR)	1.0[b]	0.25[b]	5.80	0.10[b]	0.50[b]	0.50[b]	0.03[b]	3.0	1.6	1.00	0.20[b]	5.7
Chile (PA)	1.0[b]	0.25[b]	1.00	0.10[b]	0.50[b]	0.50[b]	0.03[b]	3.0	2.3	1.30	0.20[b]	18.4
Green Bean (PA)	1.0[b]	0.25[b]	4.70	0.10[b]	0.50[b]	0.50[b]	0.03[b]	3.0	0.2[b]	2.00	0.20[b]	37.2
Lettuce (PA)	1.0[b]	0.25[b]	7.40	0.10[b]	0.50[b]	0.50[b]	0.03[b]	7.5	1.2	1.10	0.20[b]	20.0
Rhubarb (PA)	1.0[b]	0.25[b]	15.20	0.10[b]	0.50[b]	4.20	0.03[b]	8.6	3.7	1.40	0.20[b]	11.7
Tomato (PA)	1.0[b]	0.25[b]	4.70	0.10[b]	0.50[b]	0.50[b]	0.03[b]	8.1	5.8	1.20	0.20[b]	14.7
Mean	1.0	0.25	6.50	0.10	0.50	1.21	0.03	6.3	4.0	1.33	0.20	16.4
(std dev)	(0.0)	(0.00)	(4.35)	(0.00)	(0.00)	(1.40)	(0.00)	(3.2)	(4.4)	(0.33)*	(0.00)	(10.7)
Cochiti (C)/Peña Blanca (PB)/Sile (S):												
Apricot (PB)	1.0[b]	0.25[b]	1.40	0.10[b]	0.50[b]	1.40	0.03[b]	9.3	4.7	0.90	0.20[b]	7.7
Cabbage (S)	1.0[b]	0.25[b]	6.90	0.10[b]	0.50[b]	0.50[b]	0.03[b]	1.0[b]	4.0	0.80	0.20[b]	15.0
Cherry (C)	[e]	[e]	[e]	[e]	[e]	[e]	[e]	[e]	[e]	[e]	[e]	[e]
Chile (S)	1.0[b]	0.25[b]	0.91	0.10[b]	0.50[b]	0.50[b]	0.03[b]	1.0[b]	1.2	1.00	0.20[b]	22.0
Lettuce (S)												
Nectarine (S)	1.0[b]	0.25[b]	1.40	0.10[b]	0.50[b]	1.90	0.03[b]	10.0	6.0	0.80	0.20[b]	10.0
Peach (S)	1.0[b]	0.25[b]	1.70	0.10[b]	0.50[b]	0.50[b]	0.03[b]	7.7	3.7	0.90	0.20[b]	5.9
Tomato (S)	1.0[b]	0.25[b]	1.90	0.10[b]	0.50[b]	1.30	0.03[b]	1.0[b]	1.9	0.90	0.20[b]	15.0
Mean	1.0	0.25	2.37	0.10	0.50	1.02	0.03	5.0	3.6	0.88	0.20	12.6
(std dev)	(0.0)	(0.00)	(2.25)	(0.00)	(0.00)	(0.60)	(0.00)	(4.4)	(1.8)	(0.08)*	(0.00)	(5.9)
San Ildefonso Pueblo (SI)/El Rancho (ER):												
Apples (SI)	1.0[b]	0.25[b]	2.40	0.10[b]	0.49	0.67	0.03[b]	1.0[b]	2.6	0.50	0.20[b]	5.3
Apricot (ER)	1.0[b]	0.25[b]	2.30	0.10[b]	0.53	2.40	0.03[b]	5.3	1.1	0.50	0.20[b]	17.0
Corn (SI)	1.0[b]	0.25[b]	0.65	0.10[b]	0.65	0.25[b]	0.03[b]	1.0[b]	4.0	1.10	0.20[b]	25.0
Peach (SI)	1.0[b]	0.25[b]	1.70	0.10[b]	0.20[b]	2.10	0.03[b]	13.0	4.2	0.70	0.20[b]	12.0
Squash (SI)	1.0[b]	0.25[b]	11.00	0.10[b]	0.80	0.73	0.03[b]	1.0[b]	2.3	1.00	0.20[b]	26.0
Mean	1.0	0.25	3.61	0.10	0.53	1.23	0.03	4.3	2.8	0.76	0.20	17.1
(std dev)	(0.0)	(0.00)	(4.19)	(0.00)	(0.22)	(0.96)	(0.00)	(5.2)	(1.3)	(0.28)*	(0.00)	(8.8)

Table 6-14. Total Recoverable Trace Element Concentrations (μg/g dry) in Produce Collected from Regional Background, Perimeter, and On-Site Locations during the 2000 Growing Season (after fire)[a] (Cont.)

Location	Ag	As	Ba	Be	Cd	Cr	Hg	Ni	Pb	Se	Tl	Zn
On-Site Stations												
LANL (Mesa):												
Apple (TA-52)	1.0[b]	0.25[b]	4.20	0.10[b]	0.50[b]	0.50[b]	0.03[b]	4.8	1.4	1.20	0.20[b]	3.7
Apricot (TA-35)	1.0[b]	0.25[b]	5.10	0.50[b]	0.50[b]	4.20	0.03[b]	26.0	2.6	0.70	0.20[b]	5.3
Nectarine (TA-3)	1.0[b]	0.25[b]	6.90	0.10[b]	0.50[b]	0.50[b]	0.03[b]	3.0	1.6	1.30	0.20[b]	9.8
Peach (TA-3)	1.0[b]	0.25[b]	8.60	0.10[b]	0.50[b]	1.40	0.03[b]	11.0	3.2	1.20	0.20[b]	7.8
Peach (TA-35)	1.0[b]	0.25[b]	3.40	0.10[b]	0.50[b]	0.50[b]	0.03[b]	5.8	0.8	1.40	0.20[b]	14.0
Mean	1.0	0.25	5.64	0.18	0.50	1.42	0.03	10.1	1.9	1.16	0.20	8.1
(std dev)	(0.0)	(0.00)	(2.11)	(0.18)	(0.00)	(1.60)	(0.00)	(9.4)	(1.0)	(0.27)*	(0.00)	(4.0)

[a] Analysis by EPA Method 3051 for total recoverable metals.

[b] Less-than values were converted to one-half the concentration.

[c] Regional Statistical Reference Level; this is the upper-limit background concentration (mean + 2 std dev) based on data from 1994 to 1999.

[d] Means within the same column followed by an * were statistically higher than regional background using a using a Wilcoxon Rank Sum Test at the 0.05 probability level.

[e] Sample lost in analysis or not analyzed or outlier omitted. An outlier was omitted when the result was greater than three standard deviations of the mean (99% confidence level).

Table 6-15. Mean (±SD) Total Recoverable Trace Element Concentrations (μg/g dry) in Produce Collected from Regional Background, Perimeter, and On-Site Locations Before (1999) and After (2000) the Cerro Grande Fire

Location/Date	Ag	As	Ba	Be	Cd	Cr	Hg	Ni	Pb	Se	Tl	Zn
Regional Background Stations												
Abiquiu (A)/Arroyo Seco (AS)/Embudo (E)/Española Valley (EV)/La Puebla (LP)/Ojo Sarco (OS):												
1999[a]	1.0	0.25	7.6	0.10	0.50	0.80	0.03	4.4	8.6	0.20	0.20	19.5
	(0.0)	(0.00)	(6.2)	(0.00)	(0.00)	(0.73)	(0.00)	(7.7)	(12.8)	0.00	(0.00)	(14.2)
2000	1.0	0.25	19.7	0.10	0.53	1.03	0.03	8.88	4.4	0.39	0.20	24.5
	(0.0)	(0.00)	(35.5)	(0.00)	(0.12)	(2.06)	(0.00)	(15.00)	(5.7)	(0.22)*[b]	(0.00)	(16.7)
Perimeter Stations												
Los Alamos:												
1999[a]	1.00	0.25	4.7	0.10	0.50	0.50	0.03	3.4	9.2	0.20	0.20	16.2
	(0.0)	(0.00)	(3.1)	(0.00)	(0.00)	(0.00)	(0.00)	(6.5)	(8.9)	(0.00)	0.00	(18.4)
2000	1.0	0.25	5.2	0.10	0.50	1.60	0.03	21.5	13.5	1.19	0.20	9.6
	(0.0)	(0.00)	(5.3)	(0.00)	(0.00)	(1.38)	(0.00)	(32.0)	(12.5)	(0.26)*	(0.00)	(9.6)
White Rock/Pajarito Acres:												
1999[a]	1.0	0.25	7.2	0.10	0.50	0.58	0.03	3.5	7.5	0.20	0.20	20.0
	(0.0)	(0.00)	(10.0)	(0.00)	(0.00)	(0.20)	(0.00)	(6.1)	(6.6)	(0.00)	0.00	(11.6)
2000	1.0	0.25	6.5	0.10	0.50	1.21	0.03	6.3	4.0	1.33	0.20	16.4
	(0.0)	(0.00)	(4.4)	(0.00)	(0.00)	(1.40)	(0.00)	(3.2)	(4.4)	(0.33)*	(0.00)	(10.7)
Cochiti/Peña Blanca:												
1999[a]	1.0	0.25	4.4	0.10	0.50	0.72	0.03	2.3	4.8	0.20	0.20	19.0
	(0.0)	(0.00)	(7.1)	(0.00)	(0.00)	(0.49)	(0.00)	(1.2)	(3.2)	(0.00)	0.00	(12.0)
2000	1.0	0.25	2.4	0.10	0.50	1.02	0.03	5.0	3.6	0.88	0.20	12.6
	(0.0)	(0.00)	(2.3)	(0.00)	(0.00)	0.60)	(0.00)	(4.4)	(1.8)	(0.08)*	(0.00)	(5.9)
San Ildefonso Pueblo:												
1999[a]	1.0	0.25	7.7	0.10	0.50	0.50	0.03	4.6	6.9	0.20	0.20	19.6
	(0.0)	(0.00)	(9.0)	(0.00)	(0.00)	(0.00)	(0.00)	(7.00)	(5.1)	(0.00)	0.00	(10.3)
2000	1.0	0.25	3.6	0.10	0.53	1.23	0.03	4.3	2.8	0.76	0.20	17.1
	(0.0)	(0.00)	(4.2)	(0.00)	(0.22)	(0.96)	(0.00)	(5.2)	(1.3)	(0.28)*	(0.00)	(8.8)

Table 6-15. Mean (±SD) Total Recoverable Trace Element Concentrations (µg/g dry) in Produce Collected from Regional Background, Perimeter, and On-Site Locations Before (1999) and After (2000) the Cerro Grande Fire (Cont.)

Location/Date	Ag	As	Ba	Be	Cd	Cr	Hg	Ni	Pb	Se	Tl	Zn
On-Site Stations												
LANL (Mesa):												
1999[a]	1.0	0.25	6.5	0.10	0.50	0.50	0.03	1.0	4.8	0.20	0.20	6.0
	(0.0)	(0.00)	(4.9)	(0.00)	(0.00)	(0.00)	(0.00)	(0.0)	(1.9)	(0.00)	0.00	(2.8)
2000	1.0	0.25	5.6	0.18	0.50	1.42	0.03	10.1	1.9	1.16	0.20	8.1
	(0.0)	(0.00)	(2.1)	(0.18)	(0.00)	(1.60)	(0.00)	(9.4)	(1.0)	(0.27)*	(0.00)	(4.0)

[a] Fresquez and Gonzales (2000).

[b] Means within the same column and location followed by an * were statistically different from each other using a using a Wilcoxon Rank Sum Test at the 0.05 probability level.

Table 6-16. Radionuclide Concentrations in Goat's Milk Collected from Regional Background and Perimeter Locations Before (1999) and After (2000) the Cerro Grande Fire[a]

Radionuclide	Perimeter (White Rock/Pajarito Acres) 1999[a]		Perimeter (White Rock/Pajarito Acres) 2000		Regional Background (Peña Blanca) 1999[a]		Regional Background (Peña Blanca) 2000		RSRL[b]
^{238}Pu (pCi/L)	0.0071	(0.0083)[c]	–0.0042	(0.0054)[d]	–0.0240	(0.0137)	0.0000	(0.0069)	0.012
^{239}Pu (pCi/L)	0.0064	(0.0060)	0.0077	(0.0054)	–0.0146	(0.0075)	0.0037	(0.0049)	0.014
^{90}Sr (pCi/L)	2.04	(0.35)	0.52	(1.3)	0.86	(0.21)	–0.22	(1.1)	3.32
^{234}U (pCi/L)	0.14	(0.0149)[e]	0.038	(0.0119)	0.26	(0.0259)[e]	0.023	(0.0125)	0.48
^{235}U (pCi/L)	0.0057	(0.0006)[e]	0.0050	(0.0077)	0.0109	(0.0011)[e]	0.0010	(0.0035)	0.02
^{238}U (pCi/L)	0.1227	(0.0133)[e]	0.0172	(0.0078)	0.2321	(0.0232)[e]	0.0200	(0.0063)	0.43
^{tot}U (µg/L)	0.37	(0.04)[e]	0.05	(0.003)	0.70	(0.07)e	0.06	(0.02)	1.31
^{3}H (pCi/mL)	0.31	(0.63)	–0.09	(0.42)	–0.70	(0.61)	0.00	(0.00)	0.40
^{137}Cs (pCi/L)	14.00	(10.00)	1.13	(7.21)	7.70	(12.00)	0.00	(38.7)	64.23
^{131}I (pCi/L)	19.00	(10.00)	–2.0	(31.4)	–4.00	(77.00)	10.8	(16.4)	18.2
^{241}Am (pCi/L)	0.054	(0.017)	0.0007	(0.0011)	–0.011	(0.059)	–0.0120	(0.0541)	–0.0100

[a] Data from Fresquez and Gonzales (2000).
[b] Regional Statistical Reference Level; this is the upper-limit background (mean + 2 std dev) based on data from 1998 through 2000.
[c] (±1 counting uncertainty); values are the uncertainty of the analytical results at the 65% confidence level.
[d] See Appendix B for an explanation of the presence of negative values.
[e] 1998 data (Fresquez 1999).

Table 6-17. Radionuclide Concentrations in Game (Predators) and Nongame (Bottom-Feeding) Fish Upstream and Downstream of Los Alamos National Laboratory during 2000 (after fire)

Location Date	^{90}Sr (10^{-2} pCi/g dry)	^{137}Cs (10^{-2} pCi/g dry)	^{tot}U (ng/g dry)	^{238}Pu (10^{-5} pCi/g dry)	^{239}Pu (10^{-5} pCi/g dry)	^{241}Am (10^{-5} pCi/g dry)
Game Fish (Predators)						
Upstream (Abiquiu Reservoir):						
9-7-00						
Crappie	0.73 (2.78)[a]	0.00 (4.32)	3.63 (1.44)	–9.68 (9.68)	7.26 (12.10)	–20.57 (21.78)
Bass	–1.09 (2.66)[b]	–1.59 (13.41)	2.42 (1.37)	–1.21 (16.94)	8.47 (15.73)	–27.83 (32.67)
Bass	–1.69 (2.30)	–0.50 (1.72)	1.69 (1.19)	–9.68 (8.47)	1.21 (10.89)	–33.88 (27.83)
Walleye	1.57 (2.78)	–1.25 (4.77)	0.79 (0.87)	14.52 (12.10)	7.26 (10.89)	–12.10 (13.31)
Walleye	0.00 (4.24)	0.27 (0.48)	1.85 (1.23)	85.91 (19.36)	9.68 (14.52)	–20.57 (21.78)
Mean (std dev)	–0.10 (1.32)	–0.61 (0.80)	2.08 (1.05)	15.97 (40.33)	6.78 (3.27)	–22.99 (8.25)
RSRL[c]	17.0	27.7	6.5	23.6	28.3	28.9
Downstream (Cochiti Reservoir):						
6-29-00						
Bass	6.90 (5.32)	–0.24 (1.91)	6.05 (1.21)	–14.52 (7.26)	–1.21 (10.89)	–8.47 (6.05)
Bass	3.27 (3.99)	–1.23 (10.73)	7.26 (1.21)	–4.84 (14.52)	–2.42 (12.10)	18.15 (8.47)
Pike	–1.21 (3.39)	0.38 (1.04)	2.42 (1.21)	–2.42 (8.47)	3.63 (10.89)	–15.73 (8.47)
Pike	–1.09 (3.75)	–0.54 (1.73)	3.63 (1.21)	–2.42 (8.47)	15.73 (10.89)	–22.99 (18.15)
Walleye	2.42 (3.51)	[d]	2.42 (1.21)	–21.78 (2.42)	–3.63 (12.10)	–8.47 (6.05)
Mean (std dev)	2.06 (3.38)	–0.41 (0.67)	4.36 (2.20)	–9.20 (8.62)	2.42 (7.93)	–7.50 (15.55)
7-27-00						
Crappie	–1.21 (4.11)	0.90 (1.37)	8.47 (1.21)	–2.42 (6.05)	8.47 (8.47)	–1.21 (2.42)
Bass	3.51 (4.24)	0.30 (1.00)	4.84 (1.21)	–1.21 (6.05)	9.68 (7.26)	–24.20 (12.10)
Bass	0.00 (4.11)	0.00 (5.53)	7.26 (1.21)	–20.57 (20.57)	–22.99 (26.62)	–4.84 (4.84)
Bass	–3.27 (4.72)	–1.86 (4.19)	6.05 (1.21)	32.67 (14.52)	14.52 (8.47)	–14.52 (8.47)
Walleye	1.45 (4.96)	0.39 (1.34)	2.42 (1.21)	4.84 (10.89)	18.15 (12.10)	–22.99 (14.52)
Mean (std dev)	0.10 (2.58)	–0.05 (1.06)	5.81 (2.33)*	2.66 (19.27)	5.57 (16.43)	–13.55 (10.39)

Table 6-17. Radionuclide Concentrations in Game (Predators) and Nongame (Bottom-Feeding) Fish Upstream and Downstream of Los Alamos National Laboratory during 2000 (after fire) (Cont.)

Location Date	^{90}Sr (10^{-2} pCi/g dry)		^{137}Cs (10^{-2} pCi/g dry)		^{tot}U (ng/g dry)		^{238}Pu (10^{-5} pCi/g dry)		^{239}Pu (10^{-5} pCi/g dry)		^{241}Am (10^{-5} pCi/g dry)	
Game Fish (Predators) (Cont.)												
Downstream (Cochiti Reservoir): (Cont.)												
8-29-00												
Walleye	1.09	(3.51)	1.57	(1.05)	6.15	(1.52)	3.63	(8.47)	–2.42	(4.84)	–2.42	(3.63)
Bass	5.93	(3.51)	1.15	(0.80)	3.82	(1.40)	13.31	(14.52)	–4.84	(13.31)	–33.88	(27.83)
Bass	4.11	(6.66)	–0.06	(0.40)	8.54	(1.91)	116.16	(53.24)	–26.62	(24.20)	[d]	
Mean (std dev)	3.71	(2.44)*[e]	0.89	(0.85)*	6.17	(2.36)*	44.37	(62.36)	–11.29	(13.33)	–18.15	(22.25)
Nongame Fish (Bottom Feeders)												
Upstream (Abiquiu Reservoir):												
9-7-00												
Sucker	4.09	(2.47)	–0.32	(0.84)	3.56	(1.12)	3.80	(6.65)	18.05	(8.55)	7.60	(3.80)
Carp	3.61	(1.81)	–0.33	(1.24)	1.95	(2.10)	62.70	(15.20)	4.75	(9.50)	–7.60	(4.75)
Catfish	6.94	(3.14)	–1.69	(4.35)	10.91	(1.75)	18.05	(9.50)	6.65	(8.55)	0.00	(1.90)
Catfish	2.76	(2.28)	–0.18	(0.71)	12.94	(2.00)	47.50	(16.15)	21.85	(9.50)	–5.70	(6.65)
Catfish	1.81	(3.14)	–1.31	(3.70)	12.20	(1.82)	28.50	(12.35)	9.50	(11.40)	–1.90	(2.85)
Mean (std dev)	3.84	(1.94)	–0.77	(0.69)	8.31	(5.20)	32.11	(23.37)	12.16	(7.43)	–1.52	(5.92)
RSRL	13.2		26.9		16.2		9.8		19.2		16.1	
Downstream (Cochiti Reservoir):												
6-29-00												
Catfish	6.94	(3.23)	0.56	(0.95)	11.40	(0.95)	3.80	(6.65)	16.15	(8.55)	–2.85	(2.85)
Catfish	–3.33	(3.23)	0.45	(0.71)	10.45	(0.95)	–8.55	(4.75)	6.65	(8.55)	–11.40	(6.65)
Carp	–0.10	(3.04)	–0.60	(4.08)	24.70	(2.85)	1.90	(14.25)	8.55	(15.20)	–20.90	(16.15)
Carp	5.70	(3.90)	0.00	(3.33)	21.85	(1.90)	–4.75	(11.40)	3.80	(6.65)	–30.40	(125.40)
Sucker	–2.76	(3.80)	–0.28	(1.14)	6.65	(0.95)	1.90	(8.55)	11.40	(10.45)	30.40	(8.55)
Mean (std dev)	1.29	(4.77)	0.03	(0.49)	15.01	(7.82)	–1.14	(5.26)	9.31	(4.72)	–7.03	(23.32)

Table 6-17. Radionuclide Concentrations in Game (Predators) and Nongame (Bottom-Feeding) Fish Upstream and Downstream of Los Alamos National Laboratory during 2000 (after fire) (Cont.)

Location Date	^{90}Sr (10^{-2} pCi/g dry)	^{137}Cs (10^{-2} pCi/g dry)	^{tot}U (ng/g dry)	^{238}Pu (10^{-5} pCi/g dry)	^{239}Pu (10^{-5} pCi/g dry)	^{241}Am (10^{-5} pCi/g dry)
Nongame Fish (Bottom Feeders) (Cont.)						
Downstream (Cochiti Reservoir): (Cont.)						
7-27-00						
Sucker	8.17 (5.42)	–0.28 (0.75)	4.75 (0.95)	–10.45 (10.45)	5.70 (9.50)	–37.05 (893.00)
Sucker	1.43 (3.80)	–0.95 (3.39)	5.70 (0.95)	8.55 (7.60)	4.75 (8.55)	–7.60 (4.75)
Carp	–0.19 (4.37)	–0.50 (2.58)	5.70 (0.95)	–9.50 (4.75)	1.90 (9.50)	–0.95 (1.90)
Catfish	–2.57 (4.56)	0.67 (0.84)	9.50 (0.95)	5.70 (6.65)	19.00 (8.55)	–14.25 (9.50)
Catfish	–1.81 (3.80)	–1.10 (2.36)	5.70 (0.95)	–11.40 (3.80)	1.90 (8.55)	–11.40 (6.65)
Mean (std dev)	1.01 (4.29)	–0.43 (0.70)	6.27 (1.85)	–3.42 (9.70)	6.65 (7.11)	–14.25 (13.68)
8-29-00						
Catfish	–0.48 (3.14)	–1.14 (2.23)	2.51 (1.07)	176.70 (34.20)	–8.55 (15.20)	44.65 (13.30)
Catfish	3.42 (4.18)	–0.12 (0.67)	17.34 (2.32)	1.90 (10.45)	2.85 (11.40)	38.95 (27.55)
Sucker	0.48 (3.71)	0.00 (5.91)	12.46 (1.99)	–3.80 (7.60)	15.20 (11.40)	[d]
Mean (std dev)	1.14 (2.03)	–0.42 (0.63)	10.77 (7.56)	58.27 (102.61)	3.17 (11.88)	41.80 (4.03)*

[a](±1 counting uncertainty); values are the uncertainty of the analytical results at the 65% confidence level.
[b]See Appendix B for an explanation of the presence of negative values.
[c]Regional Statistical Reference Level; this is the upper-limit background concentration (mean + 2 std dev) based on data from 1981–1999.
[d]Sample lost in analysis or not analyzed or outlier omitted. An outlier was omitted when the result was greater than three standard deviations of the mean.
[e]Means within the same column and fish type followed by an * were significantly different from Abiquiu (background) using a Wilcoxon Rank Sum Test at the 0.05 probability level.

Table 6-18. Mean (±SD) Radionuclide Concentrations in Game (Predators) and Nongame (Bottom-Feeding) Fish Upstream and Downstream of Los Alamos National Laboratory Before (1999) and After (2000) the Cerro Grande Fire

Location Date	^{90}Sr (10^{-2} pCi/g dry)	^{137}Cs (10^{-2} pCi/g dry)	^{tot}U (ng/g dry)	^{238}Pu (10^{-5} pCi/g dry)	^{239}Pu (10^{-5} pCi/g dry)	^{241}Am (10^{-5} pCi/g dry)
Game Fish (Predators)						
Upstream (Abiquiu Reservoir):						
1999[a]	1.57 (2.4)	0.90 (0.41)	2.7 (0.61)	11.2 (1.5)	22.39 (14.7)*[c]	22.3 (21.6)*
2000[b]	–0.10 (1.3)	–0.61 (0.80)	2.1 (1.05)	15.9 (40.3)	6.78 (3.3)	–22.9 (8.3)
Downstream (Cochiti Reservoir):						
1999[a]	3.73 (2.5)	0.54 (0.79)	4.6 (1.99)	17.6 (31.3)	30.55 (22.1)*	67.9 (103.3)
2000[b]	1.69 (3.0)	0.06 (0.97)	5.3 (2.24)	7.7 (35.5)	0.48 (13.7)	–11.7 (13.6)
Nongame Fish (Bottom Feeders)						
Upstream (Abiquiu Reservoir):						
1999[a]	5.24 (2.3)	0.24 (0.23)	10.3 (3.96)	2.5 (25.8)	10.93 (11.8)	14.4 (12.2)*
2000[b]	3.84 (1.9)	–0.77 (0.69)	8.3 (5.20)	32.1 (23.4)*	12.16 (7.4)	–1.5 (5.9)
Downstream (Cochiti Reservoir):						
1999[a]	4.56 (3.0)	0.05 (0.23)	21.1 (10.13)*	11.4 (5.9)	22.80 (13.5)*	30.2 (42.7)
2000[b]	1.15 (3.8)	–0.25 (0.60)	10.7 (6.85)	11.7 (50.1)	6.87 (7.3)	–1.9 (26.4)

[a] Data from Fresquez and Gonzales (2000).
[b] Year 2000 data are the mean and standard deviation of three sampling dates at Cochiti Reservoir.
[c] Means within the same column, fish type, and location followed by an * were significantly different from each other using a Wilcoxon Rank Sum Test at the 0.05 probability level.

Table 6-19. Total Recoverable Trace Element Concentrations (µg/g wet weight) in Bottom-Feeding Fish (Muscle) Collected Upstream and Downstream of Los Alamos National Laboratory in 2000 (after fire)[a]

Location/Date	Ag	As	Ba	Be	Cd	Cr	Hg	Ni	Pb	Sb	Se	CN
Upstream (Abiquiu Reservoir)												
9-7-00												
Carp	1.0[b]	0.50	0.20	0.10[b]	1.10	0.50[b]	0.16	1.0[b]	0.20[b]	0.20[b]	1.60	1.60
Sucker	1.0[b]	0.50	3.20	0.10[b]	1.60	2.20	0.15	1.0[b]	0.20[b]	0.20[b]	2.00	1.60
Catfish	1.0[b]	0.25[b]	0.20	0.10[b]	1.10	0.50[b]	0.07	1.0[b]	0.20[b]	0.20[b]	1.00	1.80
Catfish	1.0[b]	0.90	0.10[b]	0.10[b]	1.60	2.20	0.03[b]	1.0[b]	0.20[b]	0.20[b]	1.00	2.00
Catfish	1.0[b]	0.60	0.10[b]	0.10[b]	1.40	1.40	0.08	1.0[b]	0.20[b]	0.20[b]	1.20	2.80
Mean	1.0	0.55	0.76	0.10	1.36	1.36	0.10	1.0	0.20	0.20	1.36	1.96
(std dev)	(0.0)	(0.23)	(1.36)	(0.00)	(0.25)	(0.85)	(0.06)	(0.0)	(0.00)	(0.00)	(0.43)	(0.50)
RSRL[c]	1.4	0.62	1.30	1.20	1.50	1.80	0.48	1.5	3.50	1.74	1.48	2.96
Downstream (Cochiti Reservoir)												
6-29-00												
Catfish	1.0[b]	0.25[b]	0.85	0.10[b]	0.50[b]	0.50[b]	0.15	1.0[b]	0.60	0.20[b]	0.60	2.40
Catfish	1.0[b]	0.25[b]	1.10	0.10[b]	0.50[b]	1.10	0.17	1.0[b]	0.60	0.20[b]	0.20[b]	1.20
Carp	1.0[b]	0.25[b]	2.00	0.10[b]	0.50[b]	0.50[b]	0.16	1.0[b]	0.60	0.20[b]	0.20[b]	1.20
Carp	1.0[b]	0.25[b]	1.40	0.10[b]	0.50[b]	1.00	0.51	1.0[b]	4.00	0.20[b]	0.40	2.00
Sucker	1.0[b]	0.25[b]	1.50	0.10[b]	0.50[b]	0.50[b]	0.08	1.0[b]	1.20	0.20[b]	0.20[b]	1.60
Mean	1.0	0.25	1.37	0.10	0.50	0.72	0.21	1.0	1.40	0.20	0.32	1.78
(std dev)	(0.0)	(0.00)	0.44	(0.00)	(0.00)	(0.30)	(0.17)	(0.0)	(1.48)	(0.00)	(0.18)	(0.52)
7-27-00												
Carp	1.0[b]	0.25[b]	1.90	0.10[b]	0.50[b]	0.50[b]	0.22	1.0[b]	1.1	0.20[b]	0.20[b]	1.20
Carp	1.0[b]	0.25[b]	0.71	0.10[b]	0.50[b]	0.50[b]	0.11	2.1	0.8	0.20[b]	0.20[b]	0.60
Carp	1.0[b]	0.25[b]	4.70	0.10[b]	0.50[b]	0.50[b]	0.13	3.7	1.5	0.20[b]	0.20[b]	0.60
Catfish	1.0[b]	0.25[b]	0.64	0.10[b]	0.50[b]	0.50[b]	0.16	1.0[b]	1.1	0.20[b]	0.20[b]	1.00
Catfish	1.0[b]	0.25[b]	1.10	0.10[b]	0.50[b]	0.50[b]	0.21	1.0[b]	0.6	0.20[b]	0.20[b]	2.00
Mean	1.0	0.25	1.81	0.10	0.50	0.50	0.17	1.8	1.0	0.20	0.20	1.08
(std dev)	(0.0)	(0.00)	(1.69)	(0.00)	(0.00)	(0.00)	(0.05)	(1.2)	(0.3)	(0.00)	(0.00)	(0.58)

Table 6-19. Total Recoverable Trace Element Concentrations (µg/g wet weight) in Bottom-Feeding Fish (Muscle) Collected Upstream and Downstream of Los Alamos National Laboratory in 2000 (after fire)[a] (Cont.)

Location/Date	Ag	As	Ba	Be	Cd	Cr	Hg	Ni	Pb	Sb	Se	CN
Downstream (Cochiti Reservoir)												
8-29-00												
Catfish	2.0[b]	0.25[b]	0.20[b]	0.10[b]	1.20	2.20	0.28	1.0[b]	0.20[b]	0.20[b]	2.00	0.60
Sucker	1.0[b]	0.25[b]	0.28	0.10[b]	0.50[b]	0.50[b]	0.25	1.0[b]	0.20[b]	0.20[b]	1.30	1.00
Catfish	1.0[b]	0.25[b]	0.44	0.10[b]	1.20	1.30	0.03[b]	1.0[b]	0.20[b]	0.20[b]	1.00	1.40
Catfish	1.0[b]	0.25[b]	0.26	0.10[b]	1.20	2.00	0.03[b]	1.0[b]	0.20[b]	0.20[b]	1.20	1.40
Catfish	1.0[b]	0.25[b]	0.22	0.10[b]	0.50[b]	1.10	0.03[b]	1.0[b]	0.20[b]	0.20[b]	1.50	1.60
Mean	1.2	0.25	0.28	0.10	0.92	1.42	0.12	1.0	0.20	0.20	1.40	1.20
(std dev)	(0.4)	(0.00)	(0.09)	(0.00)	(0.38)	(0.69)	(0.13)	(0.0)	(0.00)	(0.00)	(0.38)	(0.40)

[a] There were no statistical differences in any of the mean trace element concentrations in fish collected downstream of LANL when compared with upstream using a Wilcoxon Rank Sum Test at the 0.05 probability level.

[b] Less-than values were converted to one-half the concentration.

[c] Regional Statistical Reference Level is the upper-limit background (mean plus two standard deviations) from data collected from 1991 through 2000. CN is from present data.

Table 6-20. Mean (±SD) Total Recoverable Trace Element Concentrations (µg/g wet weight) in Bottom-Feeding Fish (Muscle) Collected Upstream and Downstream of Los Alamos National Laboratory Before (1999) and after (2000) the Cerro Grande Fire

Location Date	Ag	As	Ba	Be	Cd	Cr	Hg	Ni	Pb	Sb	Se	CN
Upstream (Abiquiu Reservoir)												
1999[a]	0.5 (0.4)	0.2 (0.1)	0.3 (0.5)	0.4 (0.5)	0.1 (0.1)	0.5 (0.5)	0.3 (0.1)	0.9 (0.3)	1.2 (1.4)	0.8 (0.7)	0.3 (0.1)	
2000[b]	1.0 (0.0)*[c]	0.6 (0.2)*	0.8 (1.4)	0.1 (0.0)	1.4 (0.3)*	1.4 (0.9)	0.1 (0.1)	1.0 (0.0)	0.2 (0.0)	0.2 (0.0)	1.4 (0.4)*	2.0 (0.5)
Downstream (Cochiti Reservoir)												
1999[a]	0.5 (0.3)	0.1 (0.1)	0.3 (0.2)	0.3 (0.4)	0.1 (0.1)	2.2 (4.2)	0.2 (0.1)	0.9 (0.3)	0.6 (0.7)	0.5 (0.6)	0.3 (0.1)	
2000[b]	1.1 (0.3)*	0.3 (0.0)	1.2 (1.2)*	0.1 (0.0)	0.6 (0.3)*	0.9 (0.6)	0.2 (0.1)	1.3 (0.7)	0.9 (1.0)	0.2 (0.0)	0.6 (0.6)	1.3 (0.5)

[a] Because Hg was the only element analyzed in 1999, the data for all of the other elements are the average of 1991 through 1997. Mercury data are from 1991 through 1999, and the average is similar to 1999 values.
[b] Average of all three sampling dates.
[c] Means within the same column and reservoir followed by an * were statistically different from one another using a Wilcoxon Rank Sum Test at the 0.05 probability level.

Table 6-21. Radionuclide Concentrations in Muscle and Bone Tissues of Elk Collected from On-Site and Regional Background Areas during 1999

Tissue/Location Sample	^{3}H (pCi/mL)[a]	^{tot}U (ng/g dry)	^{137}Cs (10^{-3} pCi/g dry)	^{90}Sr (10^{-3} pCi/g dry)	^{238}Pu (10^{-5} pCi/g dry)	^{239}Pu (10^{-5} pCi/g dry)	^{241}Am (10^{-5} pCi/g dry)
Muscle:							
LANL Elk							
TA-16	0.01 (0.62)[b]	0.88 (0.44)	11.2 (3.6)	26.0 (17.2)	1.8 (8.4)	7.9 (7.9)	–9.2 (6.6)[c]
Regional Background Elk							
Mean (std dev)[d]	0.21 (0.16)	0.83 (0.68)	95.1 (113.1)	0.7 (1.6)	–1.1 (2.5)	–0.5 (1.0)	4.4 (5.1)
RSRL[d]	0.53	2.19	321.4	3.9	3.9	1.6	14.5
Leg Bone:							
LANL Elk							
TA-16	–0.02 (0.62)	5.80 (5.80)	28.4 (18.0)	2,001.0 (208.8)	[e]	0.0 (103.4)	[e]
Regional Background Elk							
Mean (std dev)[d]	–0.01 (0.26)	2.29 (1.96)	43.1 (77.5)	1,300.7 (882.5)	13.7 (47.5)	–6.0 (8.2)	41.0 (5.3)
RSRL[d]	0.51	6.21	198.2	3,065.7	108.8	10.4	51.6

[a] pCi/mL of tissue moisture.
[b] (± counting uncertainty); values are the uncertainty of the analytical results at 65% confidence level.
[c] See Appendix B for an explanation of the presence of negative values.
[d] The mean (std dev) and the Regional Statistical Reference Level (mean + 2 std dev) are based on data collected from 1991 to 1998 (Fresquez et al., 1998b).
[e] Sample lost in analysis or not analyzed or outlier omitted. An outlier was omitted when the result was greater than three standard deviations of the mean (99% confidence level).

Table 6-22. Radionuclide Concentrations in Muscle and Bone Tissues of Deer Collected from On-Site and Regional Background Areas during 1999

Tissue/Location Sample	^{3}H (pCi/mL)[a]	^{tot}U (ng/g dry)	^{137}Cs (10^{-3} pCi/g dry)	^{90}Sr (10^{-3} pCi/g dry)	^{238}Pu (10^{-5} pCi/g dry)	^{239}Pu (10^{-5} pCi/g dry)	^{241}Am (10^{-5} pCi/g dry)
Muscle:							
LANL Deer							
TA-49	0.14 (0.61)[b]	1.80 (0.45)	21.2 (5.4)	36.9 (17.6)	4.5 (7.7)	–1.8 (6.3)[c]	–6.3 (4.1)
Regional Background Deer							
Mean (std dev)[d]	0.15 (0.25)	1.10 (0.66)	14.5 (7.3)	14.2 (12.3)	–1.8 (2.8)	3.5 (5.7)	6.2 (10.7)
RSRL[d]	0.65	2.42	29.0	38.8	3.7	14.8	27.5
Leg Bone:							
LANL Deer							
TA-49	–0.02 (0.62)	0.00 (4.40)	21.1 (13.6)	1,456.4 (140.8)	0.0 (1,896.4)	0.0 (1,843.6)	[e]
Regional Background Deer							
Mean (std dev)[d]	0.07 (0.25)	2.03 (2.10)	10.3 (25.7)	907.5 (106.1)	–5.9 (10.2)	0.6 (1.0)	59.5 (28.5)
RSRL[d]	0.57	6.23	61.8	1,119.7	14.5	2.7	116.5

[a] pCi/mL of tissue moisture.
[b] (±1counting uncertainty); values are the uncertainty of the analytical results at the 65% confidence level.
[c] See Appendix B for an explanation of the presence of negative values.
[d] The mean (std dev) and the Regional Statistical Reference Level (mean + 2 std dev) are based on data collected from 1991 to 1998 (Fresquez et al., 1998b).
[e] Sample lost in analysis or not analyzed or outlier omitted. An outlier was omitted when the result was greater than three standard deviations of the mean (99% confidence level).

Table 6-23. Radionuclide Concentrations in Honey Collected from Perimeter and Regional Background Locations during 2000 (after fire)

	Perimeter		Regional Background			
Radionuclide	**Los Alamos[a]**	**White Rock**	**Jemez**	**Española (La Puebla)**	**Española (Riverside)**	**RSRL[b]**
^{3}H (pCi/mL)[c]	0.08	0.30	0.03	0.03	0.12	5.25
	(0.67)[d]	(0.42)	(0.39)	(0.39)	(0.40)	
^{137}Cs (pCi/L)	[e]	14.0	7.0	–29.1	0.0	305.28
	(11.6)	(14.8)	(64.2)	(128.0)		
^{238}Pu (pCi/L)	0.016	0.025	0.024	0.025	0.017	0.07
	(0.018)	(0.009)	(0.011)	(0.009)	(0.004)	
^{239}Pu (pCi/L)	–0.002	0.026	0.023	0.026	0.008	0.12
	(0.016)[f]	(0.009)	(0.012)	(0.010)	(0.003)	
^{241}Am (pCi/L)	[e]	0.001	–0.019	–0.009	–0.014	0.05
	(0.002)	(0.019)	(0.006)	(0.008)		
^{90}Sr (pCi/L)	–5.47	–4.48	–1.11	0.83	–5.90	5.04
	(5.69)	(3.25)	(3.03)	(5.06)	(4.40)	
^{234}U (pCi/L)	[e]	0.25	0.18	0.22	1.13	2.12
	(0.09)	(0.09)	(0.05)	(0.10)		
^{235}U (pCi/L)	[e]	–0.00	–0.00	0.01	0.04	0.08
	(0.06)	(0.03)	(0.02)	(0.03)		
^{238}U (pCi/L)	[e]	0.25	0.15	0.24	0.90	1.66
	(0.06)	(0.03)	(0.05)	(0.09)		
^{tot}U (µg/L)	[e]	0.75	0.46	0.73	2.71	5.00
		(0.18)	(0.10)	(0.14)	(0.26)	

[a] This is a reanalysis of selected radionuclides of a sample collected in 1999.
[b] Regional Statistical Reference Level; this is the upper-limit background concentration (mean + 2 std dev) based on data from 1979 to 1995 (Fresquez et al., 1997a); U isotopes are from present data.
[c] pCi/mL of honey moisture; honey contains approximately 18% water and has a density of 1,860 g/L.
[d] (±1 counting uncertainty); values are the uncertainty of the analytical results at the 65% confidence level.
[e] Sample lost in analysis or not analyzed or outlier omitted. An outlier is a result greater than three standard deviations of the mean.
[f] See Appendix B for an explanation of the presence of negative values.

Table 6-24. Radionuclide Concentrations in Prickly Pear (Fruit) Collected from Regional Background and Perimeter Areas during the 1999 Growing Season

Location	^{3}H (pCi/mL)[a]	^{tot}U (ng/g dry)	^{137}Cs (10^{-3} pCi/g dry)	^{90}Sr (10^{-3} pCi/g dry)	^{238}Pu (10^{-5} pCi/g dry)	^{239}Pu (10^{-5} pCi/g dry)	^{241}Am (10^{-5} pCi/g dry)
Regional Background:							
Española/Santa Fe/ Jemez	–0.09 (0.59)[a,b]	6.8 (1.28)	–9.6 (56.1)	704.0 (79.2)	–3.3 (5.6)	–4.8 (10.4)	1.6 (2.4)
RSRL[c]	0.55	26.8	88.5	136.4	30.0	41.2	70.3
RSRL[d]	1.09	9.4	102.6	862.4	7.9	16.0	6.4
Off-Site Perimeter:							
San Ildefonso	0.29 (0.61)	32.3 (2.72)	9.7 (6.0)	1,064.0 (91.2)	–7.2 (8.8)	–3.2 (8.0)	6.4 (4.0)
Los Alamos	–0.14 (0.58)	20.3 (2.12)	–3.3 (40.6)	1,008.8 (80.0)	–4.0 (8.0)	–11.2 (11.2)	–9.6 (6.4)
White Rock/ Pajarito Acres	0.03 (0.59)	28.0 (2.61)	2.6 (6.8)	372.0 (46.4)	–2.4 (7.2)	0.0 (0.0)	–21.6 (20.0)

[a] (±1 counting uncertainty); values are the uncertainty of the analytical results at the 65% confidence level.
[b] See Appendix B for an explanation of the presence of negative values.
[c] Regional Statistical Reference Level; this is the upper-limit background concentration (mean + 2 std dev) based on produce data from 1994 to 1999 (Table 6-12).
[d] Regional Statistical Reference Level; this is the upper-limit background concentration (mean + 2 std dev) based on prickly pear data in 1999.

Table 6-25. Total Recoverable Trace Element Concentrations (μg/g dry) in Prickly Pear (Fruit) Collected from Regional Background and Perimeter Areas during the 1999 Growing Season[a]

Location	Ag	As	Ba	Be	Cd	Cu	Hg	Ni	Pb	Sb	Se	Tl
Regional Background:												
Española/Santa Fe/Jemez	1.0[b]	0.25[b]	23.0	0.10[b]	0.50[b]	0.50[b]	0.03[b]	57.0	54.0	0.40	0.20[b]	0.20[b]
RSRL[c]	1.3	0.57	19.5	0.45	0.46	8.50[d]	0.06	23.5	22.0	0.60	0.30	0.20
RSRL[e]	1.0[b]	0.25[b]	27.6	0.10[b]	0.50[b]	0.50[b]	0.03[b]	68.4	58.0	1.20	0.20[b]	0.20[b]
Off-Site Perimeter:												
San Ildefonso	1.0[b]	0.25[b]	120.0	0.10[b]	0.50[b]	1.50	0.03[b]	3.3	16.8	0.20[b]	0.20[b]	0.20[b]
Los Alamos	1.0[b]	0.25[b]	120.0	0.10[b]	0.50[b]	2.00	0.03[b]	4.7	3.0	0.40	0.20[b]	0.20[b]
White Rock/Pajarito Acres	1.0[b]	0.25[b]	59.0	0.10[b]	0.50[b]	1.80	0.03[b]	41.0	58.4	0.20[b]	0.40	0.20[b]

[a] Analysis by EPA Method 3051 for total recoverable metals.
[b] Less-than values were converted to one-half the concentration.
[c] Regional Statistical Reference Level; this is the upper-limit background concentration (mean + 2 std dev) based on produce data from 1994 to 1999 (Table 6-13).
[d] No Cu data in produce could be located; therefore, the RSRL is from native grass species (Fresquez et al., 1990).
[e] Regional Statistical Reference Level; this is the upper-limit background concentration (mean + 2 std dev) based on prickly pear data from 1999.

Table 6-26. Radionuclide Concentrations in Herbal Teas Collected from Regional Background Locations during 2000 Growing Season (after fire)

	Regional Background				
Radionuclide	**Saint John's Wort (La Puebla)**		**Elderberry (La Puebla)**		**RSRL[a] (Navajo Tea)**
^{238}Pu (pCi/L)	–0.003	(0.008)[b,c]	0.000	(0.007)	0.024
^{239}Pu (pCi/L)	0.008	(0.006)	0.017	(0.008)	0.039
^{90}Sr (pCi/L)	0.21	(1.69)	0.11	(1.36)	2.55
^{234}U (pCi/L)	0.53	(0.03)	0.39	(0.03)	1.90
^{235}U (pCi/L)	0.01	(0.01)	0.02	(0.01)	0.08
^{238}U (pCi/L)	0.29	(0.02)	0.23	(0.02)	1.70
^{tot}U (µg/L)	0.87	(0.07)	0.70	(0.07)	5.12
^{3}H (pCi/mL)	0.51	(0.44)	0.51	(0.44)	0.13
^{137}Cs (pCi/L)	0.0	(72.7)	–2.6	(50.7)	27.9
^{241}Am (pCi/L)	–0.001	(0.001)	–0.006	(0.004)	0.085

[a] Regional Statistical Reference Level; this is the upper-limit background concentration (mean + 2 std dev) based on Navajo Tea from 1996 to 1999.
[b] (±1 counting uncertainty); values are the uncertainty of the analytical results at the 65% confidence level.
[c] See Appendix B for an explanation of the presence of negative values.

Table 6-27. Concentration (pg/g fresh wt.) of PCBs in Whole-Body Fish and TEQs for Common Carp and Carp Suckers Collected from Cochiti and Abiquiu Reservoirs[a]

IUPAC No.:	#77		#81		#105		#114		#118		#123		#126	
Compound:	3,3',4,4'-TeCB		3,4,4',5-TeCB		2,3,3',4,4'-PeCB		2,3,4,4',5-PeCB		2,3',4,4',5-PeCB		2',3,4,4',5-PeCB		3,3',4,4',5-PeCB	
Sample ID[b]	Conc.	TEQ	Conc.	TEQ	Conc.	TEQ	Conc.	TEQ	Conc.	TEQ	Conc.	TEQ	Conc.	TEQ
Cochiti Reservoir														
Common Carp:														
6CRCARP1	121	1.21E-02	5.58	5.58E-04	1,810	1.81E-01	98.3	4.92E-02	4,960	4.96E-01	188	1.88E-02	22.4	2.24E+00
6CRCARP2	166	1.66E-02	9.73	9.73E-04	3,160	3.16E-01	177	8.85E-02	8,860	8.86E-01	311	3.11E-02	36.7	3.67E+00
6CRCARP3	20.7	2.07E-03	1.14	1.14E-04	234	2.34E-02	12.4	6.20E-03	593	5.93E-02	30.9	3.09E-03	4.61	4.61E-01
Carp Sucker:														
7CRCARP1S	37.7	3.77E-03	1.83	1.83E-04	364	3.64E-02	18.4	9.20E-03	888	8.88E-02	33.2	3.32E-03	6.66	6.66E-01
7CRCARP2S	31.3	3.13E-03	2.29	2.29E-04	480	4.80E-02	27.3	1.37E-02	1,210	1.21E-01	62.8	6.28E-03	7.66	7.66E-01
7CRCARP3S	19.4	1.94E-03	1.42	1.42E-04	227	2.27E-02	12.0	6.00E-03	559	5.59E-02	23.0	2.30E-03	3.55	3.55E-01
7CRCARP4S	32.1	3.21E-03	2.30	2.30E-04	662	6.62E-02	40.2	2.01E-02	1,790	1.79E-01	47.4	4.74E-03	7.74	7.74E-01
7CRCARP5S	91.2	9.12E-03	4.53	4.53E-04	1,030	1.03E-01	54.6	2.73E-02	2,440	2.44E-01	89.8	8.98E-03	16.3	1.63E+00
Common Carp:														
8CRCARP1	91.2	9.12E-03	7.07	7.07E-04	1,910	1.91E-01	121	6.05E-02	5,700	5.70E-01	196	1.96E-02	19.9	1.99E+00
8CRCARP2	34.5	3.45E-03	2.12	2.12E-04	480	4.80E-02	26.9	1.35E-02	1,250	1.25E-01	54.6	5.46E-03	6.86	6.86E-01
Carp Sucker:														
8CRCARPS3	17.7	1.77E-03	1.30	1.30E-04	229	2.29E-02	11.3	5.65E-03	566	5.66E-02	22.2	2.22E-03	4.57	4.57E-01
8CRCARPS4	19.2	1.92E-03	1.25	1.25E-04	206	2.06E-02	10.1	5.05E-03	492	4.92E-02	21.1	2.11E-03	3.69	3.69E-01
8CRCARPS5	33.0	3.30E-03	2.24	2.24E-04	347	3.47E-02	19.0	9.50E-03	834	8.34E-02	33.6	3.36E-03	5.72	5.72E-01
Abiquiu Reservoir														
Common Carp:														
9ARCARP1	4.81	4.81E-04	0	0.0	63.4	6.34E-03	4.43	2.22E-03	204	2.04E-02	6.29	6.29E-04	2.27	2.27E-01
9ARCARP2	10.8	1.08E-03	1.02	1.02E-04	130	1.30E-02	8.29	4.15E-03	396	3.96E-02	10.2	1.02E-03	4.43	4.43E-01
9ARCARP3	1.55	1.55E-04	0.131	1.31E-05	27.5	2.75E-03	1.90	9.50E-04	93.8	9.38E-03	2.77	2.77E-04	0.902	9.02E-02
Carp Sucker:														
9ARCARPS1	5.92	5.92E-04	0.86	8.59E-05	105	1.05E-02	0.0	0.0	316	3.16E-02	6.53	6.53E-04	3.90	3.90E-01
9ARCARPS2	7.02	7.02E-04	1.00	9.96E-05	96.8	9.68E-03	0.0	0.0	284	2.84E-02	6.02	6.02E-04	3.45	3.45E-01

Table 6-27. Concentration (pg/g fresh wt.) of PCBs in Whole-Body Fish and TEQs for Common Carp and Carp Suckers Collected from Cochiti and Abiquiu Reservoirs[a] (Cont.)

IUPAC No.:	#156		#167		#169		#170		#180		#189		Total	Total
Compound:	2,3,3',4,4',5-HxCB		2,3',4,4',5,5'-HxCB		3,3',4,4',5,5'-HxCB		2,2',3,3',4,4',5-HpCB		2,2',3,4,4',5,5'-HpCB		2,3,3',4,4',5,5'-HpCB		Conc.	TEQ
Sample ID[b]	Conc.	TEQ	Conc.	TEQ	Conc.	TEQ	Conc.	TEQ	Conc.	TEQ	Conc.	TEQ	(µg/g)	(µg/g)
Cochiti Reservoir														
Common Carp:														
6CRCARP1	715	3.58E-01	375	3.75E-03	0.00	0.00	1,900	1.90E-01	5,460	5.46E-02	54.3	5.43E-03	1.57E-02	3.61E-06
6CRCARP2	1,260	6.30E-01	661	6.61E-03	24.3	2.43E-01	3,140	3.14E-01	9,690	9.69E-02	85.2	8.52E-03	2.76E-02	6.31E-06
6CRCARP3	87.2	4.36E-02	49.1	4.91E-04	0.00	0.00	135	1.35E-02	390	3.90E-03	5.09	5.09E-04	1.56E-03	6.17E-07
Carp Sucker:														
7CRCARPS1	141	7.05E-02	69.3	6.93E-04	0.00	0.00	350	3.50E-02	970	9.70E-03	11.0	1.10E-03	2.89E-03	9.25E-07
7CRCARPS2	180	9.00E-02	81.3	8.13E-04	0.00	0.00	344	3.44E-02	983	9.83E-03	11.5	1.15E-03	3.42E-03	1.09E-06
7CRCARPS3	84.2	4.21E-02	37.4	3.74E-04	0.00	0.00	158	1.58E-02	428	4.28E-03	5.03	5.03E-04	1.56E-03	5.07E-07
7CRCARPS4	320	1.60E-01	150	1.50E-03	0.00	0.00	717	7.17E-02	2,150	2.15E-02	25.4	2.54E-03	5.94E-03	1.30E-06
7CRCARPS5	372	1.86E-01	179	1.79E-03	0.00	0.00	834	8.34E-02	2,260	2.26E-02	25.5	2.55E-03	7.40E-03	2.32E-06
Common Carp:														
8CRCARP1	793	3.97E-01	423	4.23E-03	0.00	0.00	1,970	1.97E-01	5,180	5.18E-02	56.4	5.64E-03	1.65E-02	3.50E-06
8CRCARP2	189	9.45E-02	88.9	8.89E-04	5.13	5.13E-02	370	3.70E-02	980	9.80E-03	12.6	1.26E-03	3.50E-03	1.08E-06
Carp Sucker:														
8CRCARPS3	94.9	4.75E-02	44.2	4.42E-04	0.00	0.00	200	2.00E-02	492	4.92E-03	7.21	7.21E-04	1.69E-03	6.20E-07
8CRCARPS4	75.6	3.78E-02	35.5	3.55E-04	0.00	0.00	163	1.63E-02	423	4.23E-03	5.25	5.25E-04	1.46E-03	5.07E-07
8CRCARPS5	138	6.90E-02	62.8	6.28E-04	0.00	0.00	309	3.09E-02	827	8.27E-03	10.1	1.01E-03	2.62E-03	8.16E-07
Abiquiu Reservoir														
Common Carp:														
9ARCARP1	33.5	1.68E-02	21.0	2.10E-04	6.11	6.11E-02	138	1.38E-02	656	6.56E-03	5.31	5.31E-04	1.15E-03	3.56E-07
9ARCARP2	54.8	2.74E-02	33.9	3.39E-04	6.80	6.80E-02	209	2.09E-02	674	6.74E-03	6.54	6.54E-04	1.55E-03	6.26E-07
9ARCARP3	18.0	9.00E-03	12.3	1.23E-04	2.24	2.24E-02	84.4	8.44E-03	337	3.37E-03	3.18	3.18E-04	5.86E-04	1.47E-07
Carp Sucker:														
9ARCARPS1	53.2	2.66E-02	33.4	3.34E-04	4.47	4.47E-02	172	1.72E-02	562	5.62E-03	7.01	7.01E-04	1.27E-03	5.29E-07
9ARCARPS2	47.5	2.38E-02	28.4	2.84E-04	4.25	4.25E-02	160	1.60E-02	551	5.51E-03	6.18	6.18E-04	1.20E-03	4.73E-07

[a]U = Not detected; R = peak detected, but did not meet quantification criteria; E = exceeds calibrated linear range, see dilution data; D = dilution data.
[b]Note: The number at the beginning of each sample ID indicates the month in which that sample was collected; i.e., 6 = June, 7 = July, 8 = August, 9 = September.

Table 6-28. Concentration (ng/g fresh wt.) of Organochlorine Pesticides in Whole-Body Fish (Carp and Carp Suckers) Collected from Cochiti and Abiquiu Reservoirs[a]

Sample ID[b]	Hexachloro-benzene	Alpha HCH	Beta HCH	Gamma HCH	Heptachlor	Aldrin	Oxychlordane	trans-Chlordane
Cochiti Reservoir								
Common Carp:								
6CRCARP1	1.32	0.260	U	0.166	U	U	0.549	5.64
6CRCARP2	1.43	0.263	U	0.141	U	U	0.605	6.94
6CRCARP3	0.682	0.147	U	0.148	U	U	U	0.483
Carp Sucker:								
7CRCARP1S	1.21	0.229	U	0.131	1.05	U	0.400	5.29
7CRCARP2S	0.878	0.168	U	0.337	0.184	0.151	0.777	4.03
7CRCARP3S	0.798	0.191	U	0.154	0.317	U	0.647	3.36
7CRCARP4S	1.18	0.176	U	0.189	U	U	U	1.82
7CRCARP5S	2.20		U	U	U	U		4.71
Abiquiu Reservoir								
Common Carp:								
8CRCARP1	1.09		U	U	U	U	U	5.20
8CRCARP2	1.39		U	U	U	U	U	4.91
Carp Sucker:								
8CRCARP3S	0.874	U	U	U	U	U	U	2.25
8CRCARP4S	0.850	U	U	U	U	U	U	3.16
8CRCARP5S	1.44	0.278	U	0.221	0.786	U	1.03	4.62
Common Carp:								
9ARCARP1	0.415	0.115	U	U	U	U	U	U
9ARCARP2	0.671		U	U	U	U	U	0.296
9ARCARP3	0.150	U	U	U	U	U	U	U
Carp Sucker:								
9ARCARPS1	0.846	0.174	U	U	U	U	U	0.319
9ARCARPS2	1.380	0.220	U	U	U	U	U	0.543

Table 6-28. Concentration (ng/g fresh wt.) of Organochlorine Pesticides in Whole-Body Fish (Carp and Carp Suckers) Collected from Cochiti and Abiquiu Reservoirs[a] (Cont.)

Sample ID[b]	cis-Chlordane	DDT	DDD	DDE	trans-Nonachlor	cis-Nonachlor	Mirex
Cochiti Reservoir							
Common Carp:							
6CRCARP1	7.66	1.94	14.29	111.713	9.12	3.31	0.392
6CRCARP2	9.25	2.03	12.34	142.15	13.4	4.56	0.499
6CRCARP3	0.683	0.893	2.981	22.26	0.965	0.377	0.108
Carp Sucker:							
7CRCARP1S	5.80	2.27	5.175	29.322	3.93	1.36	0.098
7CRCARP2S	5.55	4.03	5.64	44.468	5.22	1.58	0.0983
7CRCARP3S	3.65	1.39	4.648	21.696	3.35	1.21	0.0535
7CRCARP4S	2.16	3.03	7.07	47.612	2.40	0.970	0.192
7CRCARP5S	6.64	4.15	12.09	68.73	6.77	2.46	0.211
Abiquiu Reservoir							
Common Carp:							
8CRCARP1	7.79	4.06	11.5	100.504	7.19	3.00	0.302
8CRCARP2	6.35	3.79	7.48	46.312	4.45	1.95	0.146
Carp Sucker:							
8CRCARP3S	2.88	2.746	5.161	21.149	3.11	1.13	0.0827
8CRCARP4S	3.44	1.771	4.779	16.911	3.56	1.21	U
8CRCARP5S	5.23	3.911	5.88	42.019	3.60	1.15	0.108
Common Carp:							
9ARCARP1	0.378	0.523	0.4414	12.3675	0.565	0.300	0.136
9ARCARP2	0.661	0.835	0.884	32.421	1.47	0.678	0.239
9ARCARP3	U	0.343	0.128	8.66	0.280	0.106	0.152
Carp Sucker:							
9ARCARPS1	0.822	2.171	1.187	25.914	1.97	0.823	0.231
9ARCARPS2	1.240	2.592	2.298	21.867	3.00	1.20	0.201

Table 6-28. Concentration (ng/g fresh wt.) of Organochlorine Pesticides in Whole-Body Fish (Carp and Carp Suckers) Collected from Cochiti and Abiquiu Reservoirs[a] (Cont.)

Sample ID[b]	Alpha-Endo-sulphan(I)	Dieldrin	Endrin	Beta-Endo-sulphan (II)	Endo-sulphan Sulphate	Methoxy-chlor	Delta HCH	Heptachlor Epoxide
Cochiti Reservoir								
Common Carp:								
6CRCARP1	0.102	0.404	0.023	U	0.653	U	U	0.121
6CRCARP2	0.129	0.380	0.018	0.065	0.528	U	U	0.109
6CRCARP3	0.053	0.199	0.011	U	0.379	U	U	0.069
Carp Sucker:								
7CRCARP1S	0.165	0.364	0.028	U	0.965	U	U	0.287
7CRCARP2S	0.089	0.324	U	U	0.373	U	U	0.160
7CRCARP3S	0.118	0.243	U	U	0.783	U	U	0.225
7CRCARP4S	0.146	0.350	0.018[R]	0.085[R]	1.00	U	U	0.146
7CRCARP5S								
Abiquiu Reservoir								
Common Carp:								
8CRCARP1	U	0.28	U	U	0.33	U	U	0.20
8CRCARP2	0.10	0.26	U	U	0.52	U	U	0.21
Carp Sucker:								
8CRCARP3S	0.14	0.26	U	U	0.81	U	U	0.25
8CRCARP4S	0.12	0.25	U	U	0.94	U	U	0.30
8CRCARP5S								
Common Carp:								
9ARCARP1	U	0.06	0.02	U	0.32	0.14	U	0.04
9ARCARP2	U	0.14	U	U	0.24	U	U	0.09
9ARCARP3	U	0.02	U	U	0.05	U	U	U
Carp Sucker:								
9ARCARPS1	U	0.24	0.04	U	0.70	U	U	0.14
9ARCARPS2	0.16	0.37	U	U	0.84	U	U	0.23

[a]U = not detected; E = exceeds calibrated linear range, see dilution data; D = dilution data R = peak detected, but did not meet quantification criteria.
[b]Note: The number at the beginning of each sample ID indicates the month in which that sample was collected; i.e., 6 = June, 7 = July, 8 = August, 9 = September.

Table 6-29. Radionuclide Concentrations in Overstory (OS) and Understory (US) Vegetation Collected Around the DARHT Facility in 2000[a]

Sample Location	Radionuclide													
	^{3}H (pCi/mL)		^{90}Sr (pCi/g dry)		^{tot}U (µg/g dry)		^{137}Cs (pCi/g dry)		^{238}Pu (pCi/g dry)		^{239,240}Pu (pCi/g dry)		^{241}Am (pCi/g dry)	
North														
OS	0.24	(0.44)	1.19	(0.24)	1.56	(0.08)	–0.50	(1.34)	–0.001	(0.001)	0.006	(0.002)	0.006	(0.003)
US	0.15	(0.43)	1.80	(0.44)	0.54	(0.04)	0.07	(0.13)	0.003	(0.002)	0.002	(0.002)	0.007	(0.012)
East														
OS	0.33	(0.44)	0.12	(0.22)	0.04	(0.02)	–0.16	(0.76)	0.000	(0.001)	0.000	(0.001)	0.001	(0.001)
US	0.06	(0.42)	1.65	(0.40)	2.13	(0.10)	0.13	(0.06)	–0.001	(0.001)	0.003	(0.001)	–0.018	(0.051)
South														
OS	0.24	(0.44)	2.78	(0.33)	1.03	(0.06)	0.11	(0.25)	–0.000	(0.002)	0.003	(0.002)	0.003	(0.003)
US	0.15	(0.43)	0.95	(0.38)	0.53	(0.04)	–0.17	(0.49)	–0.001	(0.001)	0.001	(0.001)	0.001	(0.001)
West														
OS	–0.03	(0.41)	2.42	(0.34)	0.29	(0.03)	0.00	(0.51)	0.002	(0.001)	0.003	(0.001)	–0.001	(0.001)
US	–0.03	(0.41)	0.84	(0.39)	0.54	(0.04)	0.00	(0.37)	0.002	(0.001)	0.004	(0.001)	–0.002	(0.022)
RBG[b]														
OS	0.063	(0.64)	2.08	(0.32)	0.373	(0.040)	0.39	(0.59)	0.001	(0.001)	0.002	(0.001)	0.005	(0.002)
US	0.287	(0.66)	2.08	(0.39)	0.240	(0.027)	0.23	(0.47)	0.001	(0.001)	0.003	(0.002)	0.004	(0.002)
BSRL[c]														
OS	1.02		8.03		1.97		1.33		0.028		0.006		0.016	
US	0.99		4.75		2.89		0.98		0.004		0.013		0.011	

[a] See Figure 6-3 for locations of sample sites.
[b] RBG is the mean background concentration for samples from Embudo, Cochiti, and Jemez collected in 1999 (Fresquez and Gonzales 2000).
[c] BSRL is the Baseline Statistical Reference Level (Fresquez et al., 2001b).

Table 6-30. Total Trace Element Concentrations (µg/g dry) in Overstory (OS) and Understory (US) Vegetation Collected Around the DARHT Facility in 2000[a]

Location	Ag	As	Ba	Be	Cd	Cr	Cu	Hg	Ni	Pb	Sb	Se	Tl
North													
OS	1.00[b]	1.40[c]	58.0	0.10[b]	0.50[b]	0.50[b]	8.4	0.03[b]	1.00[b]	2.7	0.2[b]	2.10[c]	0.2[b]
US	1.00[b]	0.80[c]	44.0	0.10[b]	0.50[b]	0.50[b]	2.3	0.03[b]	1.00[b]	1.6	0.2[b]	2.00[c]	0.2[b]
East													
OS	1.00[b]	0.80[c]	18.0	0.10[b]	0.50[b]	0.50[b]	3.4	0.03[b]	1.0[b]	1.6	0.2[b]	0.90[c]	0.2[b]
US	1.00[b]	0.40[c]	45.0	0.56	0.50[b]	1.60	7.6	0.03[b]	2.7	1.8	0.8	2.00[c]	0.7
South													
OS	1.00[b]	2.00[c]	28.0	0.10[b]	0.50[b]	0.50[b]	2.9	0.03[b]	1.00[b]	2.6	0.2[b]	1.60[c]	0.2[b]
US	1.00[b]	0.70[c]	22.0	0.10[b]	0.50[b]	0.50[b]	5.9	0.03[b]	1.00[b]	0.7	0.2[b]	2.00[c]	0.2[b]
West													
OS	1.00[b]	0.50[c]	20.0	0.10[b]	0.50[b]	0.50[b]	2.6	0.03[b]	1.00[b]	4.5	0.2[b]	1.40[c]	0.2[b]
US	1.00[b]	2.00[c]	38.0	0.10[b]	0.50[b]	0.50[b]	7.9	0.03[b]	1.00[b]	3.7	0.2[b]	1.70[c]	0.2[b]
RBG													
OS[d]	0.13	0.1	32.5	0.06	0.13	0.63		0.05	1.10	0.4	0.20	0.20	0.5
US[e]	0.13	0.1	69.0	0.06	0.25	0.63	4.8	0.05	1.10	0.7	0.20	0.20	0.5
BSRL[f]													
OS	1.03	0.28	67.9	0.13	0.56	1.00	4.60	0.06	4.95	6.10	8.55	0.35	0.27
US	1.11	0.28	82.0	0.12	0.56	0.77	12.4	0.09	5.58	3.19	8.54	0.27	0.27

[a] See Figure 6-3 for locations of sample sites.
[b] Less than values are reported as one-half the detection limit.
[c] Analyses that were found to have a strong positive bias resulting from analytical problems and were not used in these calculations.
[d] Overstory vegetation samples were not collected in 2000; overstory RBG samples were collected in 1996 (Fresquez et al., 1997c).
[e] Understory vegetation samples were not collected in 2000; understory RBG samples were collected in 1996 (Fresquez et al., 1997c).
[f] BSRL is the Baseline Statistical Reference Level (Fresquez et al., 2001b).

Table 6-31. Radionuclide Concentrations in Raccoons Collected from On-Site and Perimeter Locations during 2000 (before fire)

Tissue Radionuclide	On-Site (TA-54)		Perimeter (Los Alamos)		RSRL[a]
Muscle					
^{238}Pu (pCi/g ash)	0.0053	(0.0015)[b]	0.0000	(0.0007)	0.0014
^{239}Pu (pCi/g ash)	0.0010	(0.0009)	0.0002	(0.0006)	0.0014
^{90}Sr (pCi/g ash)	–2.52	(1.55)[c]	–0.81	(1.06)	1.3
^{tot}U (µg/g ash)	0.03	(0.01)	0.03	(0.01)	0.05
^{3}H (pCi/mL)	10.20	(1.20)	–0.17	(0.45)	0.73
^{137}Cs (pCi/g ash)	1.99	(0.34)	0.23	(0.18)	0.59
^{241}Am (pCi/g ash)	–0.001	(0.001)	–0.004	(0.017)	0.03
Bone					
^{238}Pu (pCi/g ash)	–0.0001	(0.0007)	–0.0001	(0.0008)	0.0015
^{239}Pu (pCi/g ash)	0.0014	(0.0010)	0.0015	(0.0008)	0.0031
^{90}Sr (pCi/g ash)	3.04	(0.76)	1.03	(1.11)	3.3
^{tot}U (µg/g ash)	0.03	(0.01)	0.02	(0.01)	0.04
^{3}H (pCi/mL)	10.10	(1.20)	–0.04	(0.46)	0.88
^{137}Cs (pCi/g ash)	–0.03	(0.20)	–0.02	(0.11)	0.20
^{241}Am (pCi/g ash)	–0.001	(0.001)	–0.003	(0.005)	0.01

[a] Regional Statistical Reference Level; this is the upper-limit background concentration (mean + 2 std dev) based on present (perimeter) data.
[b] (±1 counting uncertainty); values are the uncertainty of the analytical results at the 65% confidence level.
[c] See Appendix B for an explanation of the presence of negative values.

G. Figures

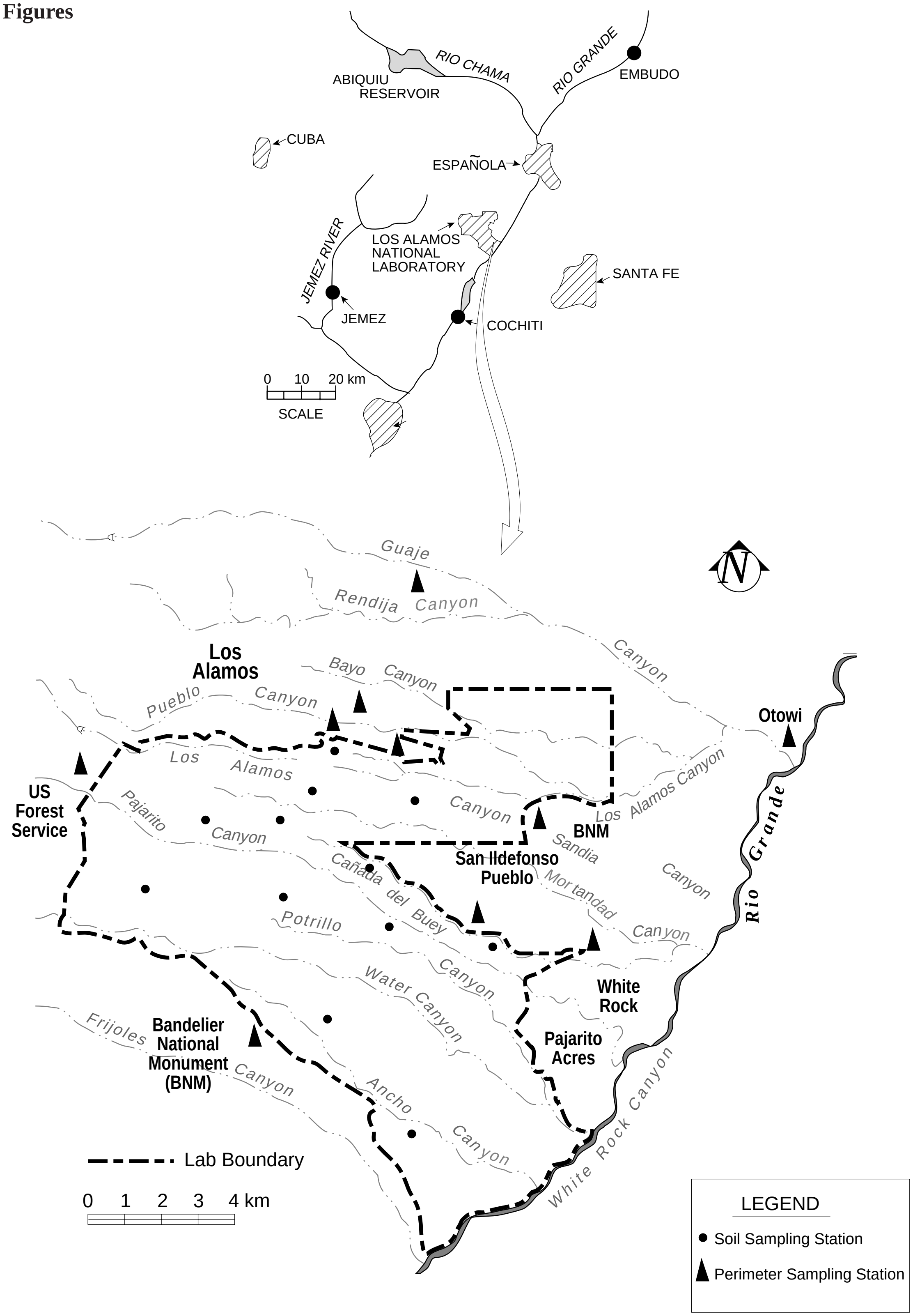

Figure 6-1. Off-site regional (top) and perimeter and on-site (bottom) Laboratory soil sampling locations.

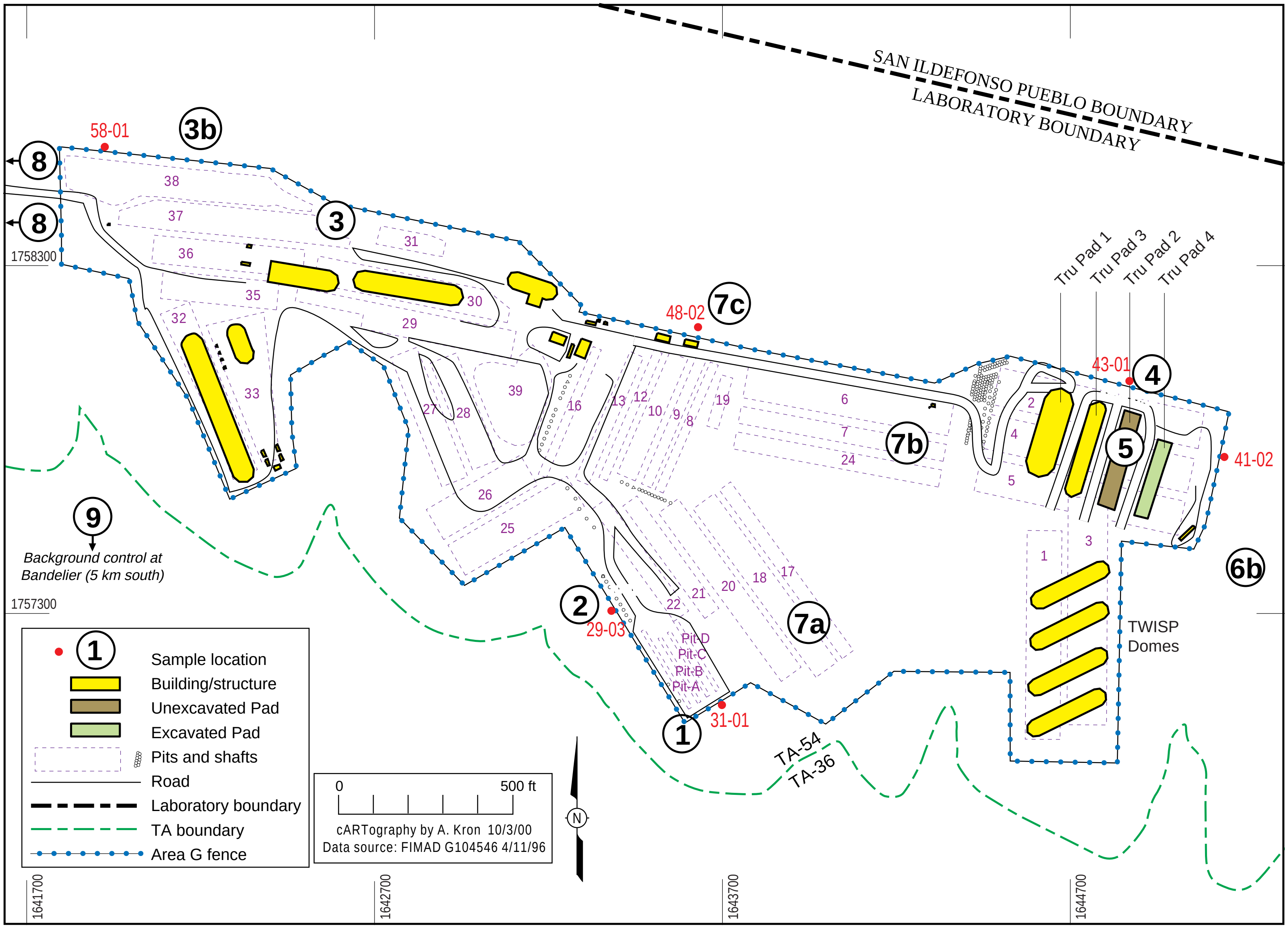

Figure 6-2. Site/sample locations of soils and vegetation at Area G. Site #8 is located farther west and Site #9 is located farther south than what is shown here.

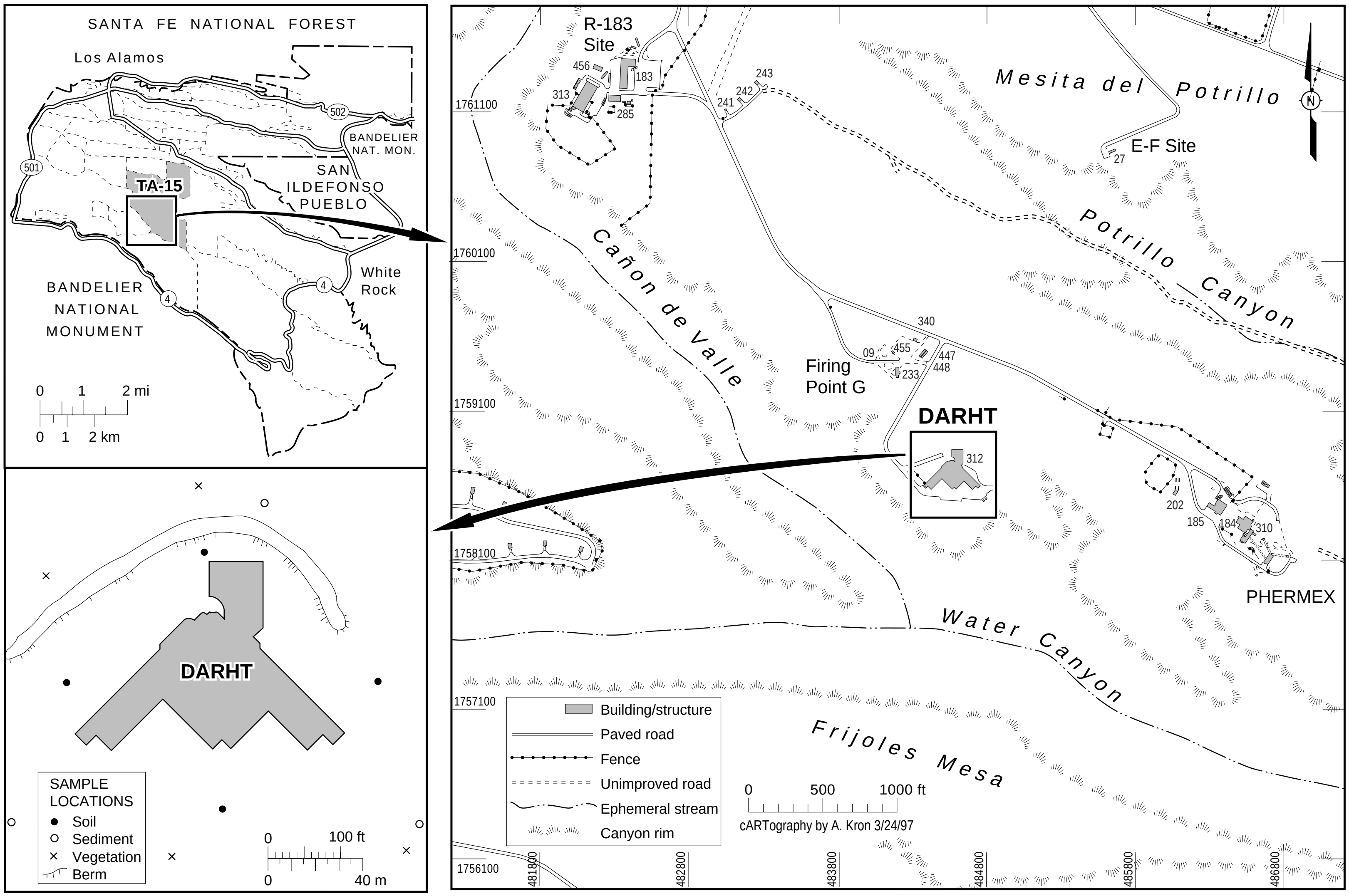

Figure 6-3. Sampling locations at the DARHT facility at TA-15.

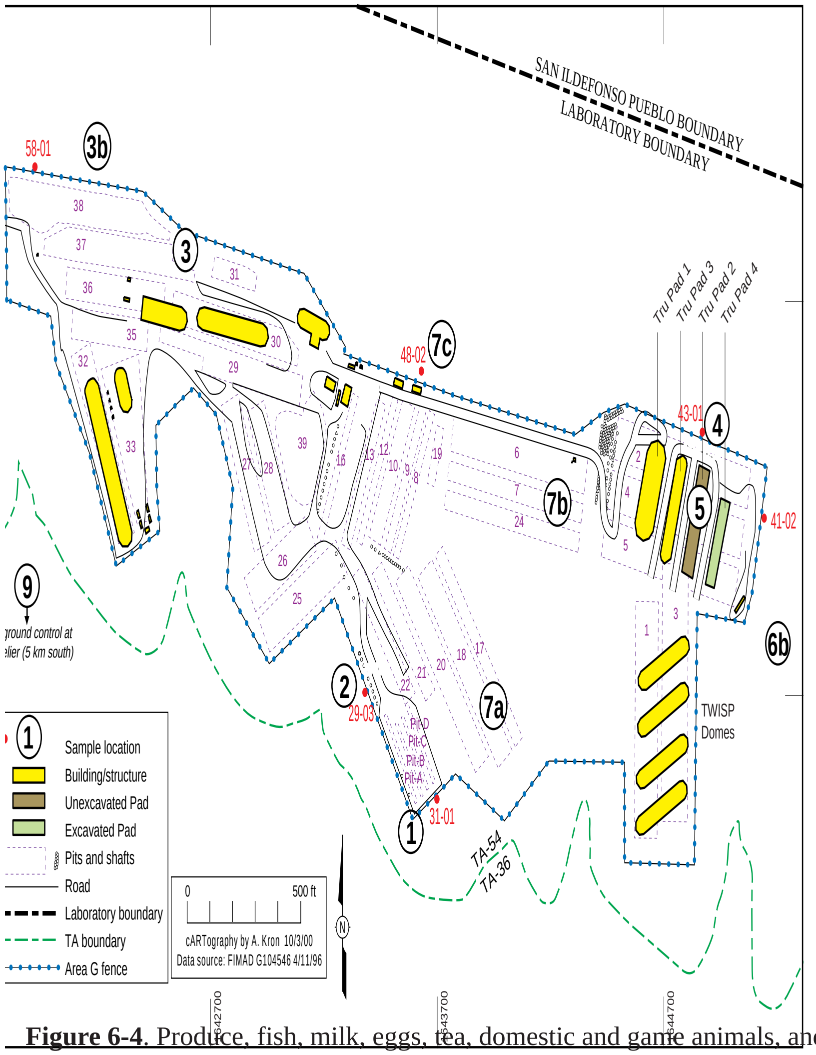

Figure 6-4. Produce, fish, milk, eggs, tea, domestic and game animals, and beehive sampling locations. (Map denotes general locations only.)

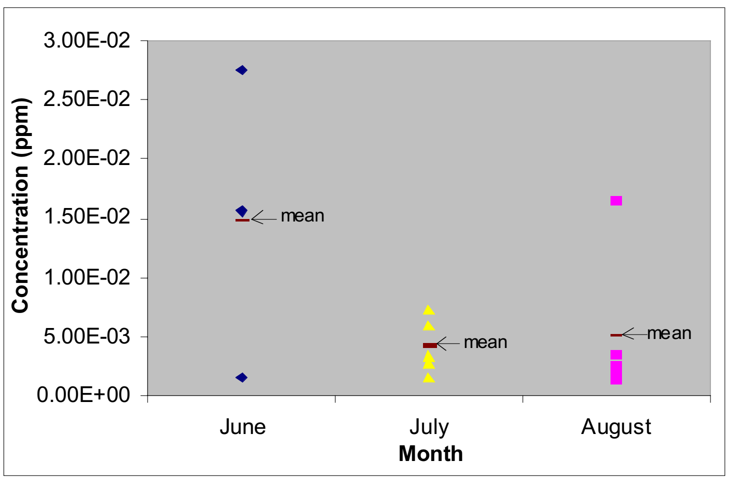

Figure 6-5. Concentrations of total PCBs measured in common carp and carp sucker in Cochiti Reservoir in 2000.

Fig. 6-6. Adult chorus frog.

Fig. 6-7. Chorus frog collection location – Canjillon, New Mexico.

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Standards for Environmental Contaminants

Throughout this report, we compare concentrations of radioactive and chemical constituents in air and water samples with pertinent standards and guidelines in regulations of federal and state agencies. No comparable standards for soils, sediments, or foodstuffs are available. Los Alamos National Laboratory (LANL or the Laboratory) operations are conducted in accordance with directives for compliance with environmental standards. These directives are contained in Department of Energy (DOE) Orders 5400.1, "General Environmental Program;" 5400.5, "Radiation Protection of the Public and the Environment;" 5480.1, "Environmental Protection, Safety, and Health Protection Standards;" 5480.11, "Requirements for Radiation Protection for Occupational Workers;" 5484.1, "Environmental Radiation Protection, Safety, and Health Protection Information Reporting Requirements," Chap. III, "Effluent and Environmental Monitoring Program Requirements," and 231.1, "Environmental Safety and Health Reporting."

Radiation Standards. DOE regulates radiation exposure to the public and the worker by limiting the radiation dose that can be received during routine Laboratory operations. Because some radionuclides remain in the body and result in exposure long after intake, DOE requires consideration of the dose commitment caused by inhalation, ingestion, or absorption of such radionuclides. This evaluation involves integrating the dose received from radionuclides over a standard period of time. For this report, 50-yr dose commitments were calculated using the DOE dose factors from DOE 1988a and DOE 1988b. The dose factors DOE adopted are based on the recommendations of Publication 30 of the International Commission on Radiological Protection (ICRP 1988).

In 1990, DOE issued Order 5400.5, which finalized the interim radiation protection standard (RPS) for the public (NCRP 1987). Table A-1 lists currently applicable RPSs, now referred to as public dose limits (PDLs), for operations at the Laboratory. DOE's comprehensive PDL for radiation exposure limits the effective dose equivalent (EDE) that a member of the public can receive from DOE operations to 100 mrem per year. The PDLs and the DOE dose factors are based on recommendations in ICRP (1988) and the National Council on Radiation Protection and Measurements (NCRP 1987).

The EDE is the hypothetical whole-body dose that would result in the same risk of radiation-induced cancer or genetic disorder as a given exposure to an individual organ. It is the sum of the individual organ doses, weighted to account for the sensitivity of each organ to radiation-induced damage. The weighting factors are taken from the recommendations of the ICRP. The EDE includes doses from both internal and external exposure.

Radionuclide concentrations in air or water are compared to DOE's Derived Concentration Guides (DCGs) to evaluate potential impacts to members of the public. The DCGs for air are the radionuclide concentrations in air that, if inhaled continuously for an entire year, would give a dose of 100 mrem. Similarly, the DCGs for water are those concentrations in water that if consumed at a maximum rate of 730 liters per year, would give a dose of 100 mrem per year. Derived air concentrations (DACs) were developed for protection of workers and are the air concentrations that, if inhaled throughout a "work year," would give the limiting allowed dose to the worker. Table A-2 shows the DCGs and DACs.

In addition to DOE standards, in 1985 and 1989, the EPA established the National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities, 40 CFR 61, Subpart H. This regulation states that emissions of radionuclides to the ambient air from Department of Energy facilities shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/yr. DOE has adopted this dose limit (Table A-1). This dose is calculated at the location of a residence, school, business or office. In addition, the regulation requires monitoring of all release points that can produce a dose of 0.1 mrem to a member of the public. A complete listing a 40 CFR 61 Subpart H is available in ESH-17 2000.

Nonradioactive Air Quality Standards. Table A-3 shows federal and state ambient air quality standards for nonradioactive pollutants.

National Pollutant Discharge Elimination System. Table A-4 presents a summary of the outfalls, the types of monitoring required under National Pollutant Discharge Elimination System (NPDES), and the limits established for sanitary and industrial outfalls. Table A-5 presents NPDES annual water quality parameters for all outfalls.

Drinking Water Standards. For chemical constituents in drinking water, regulations and standards are issued by the Environmental Protection Agency (EPA) and adopted by the New Mexico Environment Department (NMED) as part of the New Mexico Drinking Water Regulations (Table A-6) (NMEIB 1995). EPA's secondary drinking water standards, which are not included in the New Mexico Drinking Water Regulations and are not enforceable, relate to contaminants in drinking water that primarily affect aesthetic qualities associated with public acceptance of drinking water (EPA 1989b). There may be health effects associated with considerably higher concentrations of these contaminants.

Radioactivity in drinking water is regulated by EPA regulations contained in 40 CFR 141 (EPA 1989b) and New Mexico Drinking Water Regulations, Sections 206 and 207 (NMEIB 1995). These regulations provide that combined radium-226 and radium-228 may not exceed 5 pCi per liter. Gross alpha activity (including radium-226, but excluding radon and uranium) may not exceed 15 pCi per liter.

A screening level of 5 pCi per liter for gross alpha is established to determine when analysis specifically for radium isotopes is necessary. In this report, plutonium concentrations are compared with both the EPA gross alpha standard for drinking water (Table A-6) and the DOE guides calculated for the DCGs applicable to drinking water (Table A-2).

For man-made beta- and photon-emitting radionuclides, EPA drinking water standards are limited to concentrations that would result in doses not exceeding 4 mrem per year, calculated according to a specified procedure. In addition, DOE Order 5400.5 requires that persons consuming water from DOE-operated public water supplies do not receive an EDE greater than 4 mrem per year. DCGs for drinking water systems based on this requirement are in Table A-2.

Surface Water Standards. Concentrations of radionuclides in surface water samples may be compared to either the DOE DCGs (Table A-2) or the New Mexico Water Quality Control Commission (NMWQCC) stream standard, which references the state's radiation protection regulations. However, New Mexico radiation levels are in general two orders of magnitude greater than DOE's DCGs for public dose, so only the DCGs will be discussed here. The concentrations of nonradioactive constituents may be compared with the NMWQCC Livestock Watering and Wildlife Habitat stream standards (NMWQCC 1995). (See Tables A-7 and A-8.) The NMWQCC groundwater standards can also be applied in cases where discharges may affect groundwater.

Organic Analysis of Surface and Groundwaters: Methods and Analytes. Organic analyses of surface waters, groundwaters, and sediments are made using SW-846 methods as shown in Table A-9. This table shows the number of analytes included in each analytical suite. The specific compounds analyzed in each suite are listed in Tables A-10 through A-13.

Table A-1. Department of Energy Public Dose Limits for External and Internal Exposures

	Effective Dose Equivalent[a] at Point of Maximum Probable Exposure
Exposure of Any Member of the Public[b]	
All Pathways	100 mrem/yr[c]
Air Pathway Only[d]	10 mrem/yr
Drinking Water	4 mrem/yr
Occupational Exposure[b]	
Stochastic Effects	5 rem (annual EDE[e])
Nonstochastic Effects	
Lens of eye	15 rem (annual EDE[e])
Extremity	50 rem (annual EDE[e])
Skin of the whole body	50 rem (annual EDE[e])
Organ or tissue	50 rem (annual EDE[e])
Unborn Child	
Entire gestation period	0.5 rem (annual EDE[e])

[a] As used by DOE, effective dose equivalent (EDE) includes both the EDE from external radiation and the committed EDE to individual tissues from ingestion and inhalation during the calendar year.

[b] In keeping with DOE policy, exposures must be limited to as small a fraction of the respective annual dose limits as practicable. DOE's public dose limit (PDL) applies to exposures from routine Laboratory operation, excluding contributions from cosmic, terrestrial, and global fallout; self-irradiation; and medical diagnostic sources of radiation. Routine operation means normal, planned operation and does not include actual or potential accidental or unplanned releases. Exposure limits for any member of the general public are taken from DOE Order 5400.5 (DOE 1990). Limits for occupational exposure are taken from 10 CFR 835, Occupational Radiation Protection.

[c] Under special circumstances and subject to approval by DOE, this limit on the EDE may be temporarily increased to 500 mrem/yr, provided the dose averaged over a lifetime does not exceed the principal limit of 100 mrem per year.

[d] This level is from EPA's regulations issued under the Clean Air Act, (40 CFR 61, Subpart H) (EPA 1989a).

[e] Annual EDE is the EDE received in a year.

Table A-2. Department of Energy's Derived Concentration Guides for Water and Derived Air Concentrations[a]

Nuclide	f_1[b]	DCGs for Water Ingestion in Uncontrolled Areas (pCi/L)	DCGs for Drinking Water Systems (pCi/L)	DCGs for Air Inhalation by the Public (µCi/mL)	Class[b]	DACs for Occupational Exposure (µCi/mL)
^{3}H	—	2,000,000	80,000	1×10^{-7}[c]	—	2×10^{-5}[c]
^{7}Be	5×10^{-3}	1,000,000	40,000	4×10^{-8}	Y	8×10^{-6}
^{89}Sr	2×10^{-5}	20,000	800	3×10^{-10}	Y	6×10^{-8}
^{90}Sr[b]	1×10^{-6}	1,000	40	9×10^{-12}	Y	2×10^{-9}
^{137}Cs	1×10^{0}	3,000	120	4×10^{-10}	D	7×10^{-8}
^{234}U	5×10^{-2}	500	20	9×10^{-14}	Y	2×10^{-11}
^{235}U	5×10^{-2}	600	24	1×10^{-13}	Y	2×10^{-11}
^{238}U	5×10^{-2}	600	24	1×10^{-13}	Y	2×10^{-11}
^{238}Pu	1×10^{-3}	40	1.6	3×10^{-14}	W	3×10^{-12}
^{239}Pu[b]	1×10^{-3}	30	1.2	2×10^{-14}	W	2×10^{-12}
^{240}Pu	1×10^{-3}	30	1.2	2×10^{-14}	W	2×10^{-12}
^{241}Am	1×10^{-3}	30	1.2	2×10^{-14}	W	2×10^{-12}

[a]Guides for uncontrolled areas are based on DOE's public dose limit for the general public (DOE 1990); those for occupational exposure are based on radiation protection standards in 10 CFR 835. Guides apply to concentrations in excess of those occurring naturally or that are due to worldwide fallout.
[b]Gastrointestinal tract absorption factors (f_1) and lung retention classes (Class) are taken from ICRP30 (ICRP 1988). Codes: Y = year, D = day, W = week.
[c]Tritium in the HTO form.

Table A-3. National (40 CFR 50) and New Mexico (20 NMAC 2.3) Ambient Air Quality Standards

Pollutant	Averaging Time	Unit	New Mexico Standard	Federal Standards Primary	Federal Standards Secondary
Sulfur dioxide	Annual	ppm	0.02	0.030[a]	
	24 hours	ppm	0.10	0.14[b]	
	3 hours	ppm			0.5[b]
Hydrogen sulfide	1 hour	ppm	0.010[b]		
Total reduced sulfur	1/2 hour	ppm	0.003[b]		
Total Suspended Particulates	Annual	µg/m^3	60	50	50
	30 days	µg/m^3	90		
	7 days	µg/m^3	110		
	24 hours	µg/m^3	150		
PM_{10}[c]	Annual	µg/m^3		50	50
	24 hours	µg/m^3		150	150
$PM_{2.5}$[d]	Annual	µg/m^3		15[e]	15[e]
	24 hours	µg/m^3		65[e]	65[e]
Carbon monoxide	8 hours	ppm	8.7	9[b]	
	1 hour	ppm	13.1	35[b]	
Ozone[f]	1 hour	ppm		0.12	0.12
	8 hours	ppm		0.08	0.08
Nitrogen dioxide	Annual	ppm	0.05	0.053	0.053
	24 hours	ppm	0.10		
Lead and lead compounds	Calendar quarter	µg/m^3		1.5	1.5

[a]Not to be exceeded in a calendar year.
[b]Not to be exceeded more than once in a calendar year.
[c]Particles ≤10 µm in diameter.
[d]Particles ≤2.5 µm in diameter.
[e]Applicable when the EPA approves changes to the NM State Implementation Plan.
[f]As the result of a May 14, 1999, court ruling, EPA does not have the authority to implement the eight-hour ozone standard. Currently, LANL must meet the one-hour ozone standard. EPA has appealed the court decision.

Table A-4. Limits Established by National Pollutant Discharge Elimination System Permit No. NM0028355 for Sanitary and Industrial Outfall Discharges for 2000

Discharge Category	Permit Parameter		Daily Average		Daily Maximum	
Sanitary						
13S TA-46 SWS Facility	BOD[a]	concentration	30	mg/L	45	mg/L
		loading limit	100	lb/day	N/A[b]	
	TSS[c]	concentration	30	mg/L	45	mg/L
		loading limit	100	lb/day	N/A	
	Fecal coliform bacteria[d]		500	colonies/100 mL	500	colonies/100 mL
	pH		6.0–9.0 s.u.		6.0–9.0 s.u.	
	Flow[e]		Report		Report	

Discharge Category	Number of Outfalls	Sampling Frequency	Permit Parameter	Daily Average	Daily Maximum	Unit of Measurement
Industrial						
001 Power Plant	1	Monthly	TSS	30	100	mg/L
			Free available CL_2	0.2	0.5	mg/L
			pH	6.0–9.0	6.0–9.0	s.u.
02A Boiler Blowdown	1	Every 3 months	TSS	30	100	mg/L
			Total Fe	10	40	mg/L
			Total Cu	1.0	1.0	mg/L
			Total P	20	40	mg/L
			Sulfite	35	70	mg/L
			Total Cr	1.0	1.0	mg/L
			pH	6.0–9.0	6.0–9.0	s.u.
03A Treated Cooling Water	16	Every 3 months	TSS	30	100	mg/L
			Free available Cl	0.2	0.5	mg/L
			Total P	20	40	mg/L
			Total As	0.04	0.04	mg/L
			pH	6.0–9.0	6.0–9.0	s.u.
04A Noncontact Cooling Water	13	Every 3 months	pH	6.0–9.0	6.0–9.0	s.u.
			Total residual CL_2	Report[f]	Report	mg/L
051 Radioactive Liquid Waste Treatment Facility (TA-50)	1	Variable: weekly to monthly	COD[g]	94	156	lb/day
			TSS	18.8	62.6	lb/day
			Total Cd	0.06	0.30	lb/day
			Total Cr	0.19	0.38	lb/day
			Total Cu	0.63	0.63	lb/day
			Total Fe	1.0	2.0	lb/day
			Total Pb	0.06	0.15	lb/day
			Total Hg	0.003	0.09	lb/day
			Total Zn	0.62	1.83	lb/day
			TTO[h]	1.0	1.0	mg/L
			Total Ni[f]	Report	Report	mg/L
			Total N[f]	Report	Report	mg/L
			Nitrate-Nitrate as N[f]	Report	Report	mg/L
			Ammonia (as N)[f]	Report	Report	mg/L

Table A-4. (Cont.)

Discharge Category	Number of Outfalls	Sampling Frequency	Permit Parameter	Daily Average	Daily Maximum	Unit of Measurement
051 (Cont.)			pH	6.0–9.0	6.0–9.0	s.u.
			COD	125	125	mg/L
			Total Cd	0.2	0.2	mg/L
			Total Cr	5.1	5.1	mg/L
			Total Cu	1.6	1.6	mg/L
			Total Pb	0.4	0.4	mg/L
			Total Zn	95.4	95.4	mg/L
			^{226}Ra and ^{228}Ra	30.0	30.0	pCi/L
05A High Explosive Wastewater	2	Every 3 months	Oil & Grease	15	15	mg/L
			COD	125	125	mg/L
			TSS	30.0	45.0	mg/L
			pH	6.0–9.0	6.0–9.0	s.u.
06A Photo Wastewater	1	Every 3 months	Total Ag	0.5	1.0	mg/L
			pH	6.0–9.0	6.0–9.0	s.u.

[a]Biochemical oxygen demand.
[b]Not applicable.
[c]Total suspended solids.
[d]Logarithmic mean.
[e]Discharge volumes are reported to EPA but are not subject to limits.
[f]Concentrations are reported to EPA but are not subject to limits.
[g]Chemical oxygen demand.
[h]Total toxic organics.
Note: Sampling frequency for the sanitary outfall varies from once a week to once every three months, depending on the parameter.

Table A-5. Annual Water Quality Parameters Established by National Pollutant Discharge Elimination System Permit No. NM0028355 for Sanitary and Industrial Outfall Discharges for 2000

Discharge Category	Number of Outfalls	Sampling Frequency	Permit Parameter	Daily Average	Daily Maximum	Unit of Measurement
All Outfall Categories: Annual Water Quality Parameters	36	Annually	Total Al	5.0	5.0	mg/L
			Total As	0.04	0.04	mg/L
			Total B	5.0	5.0	mg/L
			Total Cd	0.2	0.2	mg/L
			Total Cr	5.1	5.1	mg/L
			Total Co	1.0	1.0	mg/L
			Total Cu	1.6	1.6	mg/L
			Total Pb	0.4	0.4	mg/L
			Total Hg	0.01	0.01	mg/L
			Total Se	0.05	0.05	mg/L
			Total V	0.1	0.1	mg/L
			Total Zn	95.4	95.4	mg/L
			^{226}Ra and ^{228}Ra	30.0	30.0	pCi/L
			^{3}H[a]	3,000,000	3,000,000	pCi/L

[a]When accelerator produced.

Table A-6. Safe Drinking Water Act Maximum Contaminant Levels in the Water Supply for Radiochemicals, Inorganic Chemicals, and Microbiological Constituents

Contaminants	Level
Radiochemical:	**Maximum Contaminant Level**
Gross alpha	15 pCi/L
Gross beta & photon	4 mrem/yr
^{226}Ra & ^{228}Ra	5 pCi/L
U	30 µg/L[a]
Radon	300/4000 pCi/L[b]
	Screening Level
Gross alpha	5 pCi/L
Gross beta	50 pCi/L
Inorganic Chemical:	
Primary Standards	**Maximum Contaminant Level (mg/L)**
Asbestos	7 million fibers/L (longer than 10 µm)
As	0.05[c]
Ba	2
Be	0.004
Cd	0.005
CN	0.2
Cr	0.1
F	4
Hg	0.002
Ni	0.1
NO_3 (as N)	10
NO_2 (as N)	1
SO_4	500[d]
Se	0.05
Sb	0.006
Tl	0.002
	Action Levels (mg/L)
Pb	0.015
Cu	1.3
Secondary Standards	**(mg/L)**
Cl	250
Cu	1
Fe	0.3
Mn	0.05
Zn	5
Total Dissolved Solids	500
pH	6.5–8.5
Microbiological:	**Maximum Contaminant Level**
Presence of total coliforms	5% of samples/month
Presence of fecal coliforms or Escherichia coli	No coliform-positive repeat samples following a fecal coliform-positive sample

[a]Effective December 2003.
[b]Radon standard is 4000 pCi/L with an approved state Multimedia Mitigation program and 300 pCi/L in states without an approved program.
[c]Proposed standard. Scheduled for revision in 2001.
[d]The proposed MCL for sulfate was suspended by the EPA on August 6, 1996.

Table A-7. Livestock Watering Standards[a]

Livestock Contaminant	Concentration	
Dissolved Al	5	mg/L
Dissolved As	0.2	mg/L
Dissolved B	5	mg/L
Dissolved Cd	0.05	mg/L
Dissolved Cr	1	mg/L
Dissolved Co	1	mg/L
Dissolved Cu	0.5	mg/L
Dissolved Pb	0.1	mg/L
Total Hg	0.01	mg/L
Dissolved Se	0.05	mg/L
Dissolved V	0.1	mg/L
Dissolved Zn	25	mg/L
^{226}Ra and ^{228}Ra	30	pCi/L
^{3}H	20,000	pCi/L
Gross alpha	15	pCi/L

[a]NMWQCC 1995.

Table A-8. Wildlife Habitat Stream Standards[a]

The following narrative standard shall apply:

1. Except as provided below in Paragraph 2 of this section, no discharge shall contain any substance, including, but not limited to selenium, DDT, PCBs, and dioxin, at a level which, when added to background concentrations, can lead to bioaccumulation to toxic levels in any animal species. In the absence of site-specific information, this requirement shall be interpreted as establishing a stream standard of 2 µg per liter for total recoverable selenium and of 0.012 µg per liter for total mercury.
2. The discharge of substances that bioaccumulate in excess of levels specified above in Paragraph 1 is allowed if, and only to the extent that, the substances are present in the intake waters which are diverted and utilized prior to discharge, and then only if the discharger utilizes best available treatment technology to reduce the amount of bioaccumulating substances which are discharged.
3. Discharges to waters which are designated for wildlife habitat uses, but not for fisheries uses, shall not contain levels of ammonia or chlorine in amounts which reduce biological productivity and/or species diversity to levels below those which occur naturally and in no case shall contain chlorine in excess of 1 mg per liter nor ammonia in excess of levels that can be accomplished through best reasonable operating practices at existing treatment facilities.
4. A discharge which contains any heavy metal at concentrations in excess of the concentrations set forth in Section 3101.J.1 of these standards shall not be permitted in an amount, measured by total mass, which exceeds by more than 5% the amount present in the intake waters which are diverted and utilized prior to the discharge, unless the discharger has taken steps (an approved program to require industrial pretreatment or a corrosion program) appropriate to reduce influent concentration to the extent practicable.

[a]NMWQCC 1995.

Table A-9. Organic Analytical Methods

Test	SW-846 Method	Number of Compounds
Volatiles	624, 8260B	68
Semivolatiles	625, 8270C	69
PCB[a]	608, 8082, 8081	8
HE[b]	8330	14

[a] Polychlorinated biphenyls.
[b] High explosives.

Table A-10. Volatile Organic Compounds

Analytes	Limit of Quantitation Water (μg/L)
1,1,1,2-Tetrachloroethane	1
1,1,1-Trichloroethane	1
1,1,2,2-Tetrachloroethane	1
1,1,2-Trichloroethane	1
1,1-Dichloroethane	1
1,1-Dichloroethylene	1
1,1-Dichloropropene	1
1,2,3-Trichloropropane	1
1,2,4-Trimethylbenzene	1
1,2-Dibromo-3-chloropropane	1
1,2-Dibromoethane	1
1,2-Dichlorobenzene	1
1,2-Dichloroethane	1
1,2-Dichloropropane	1
1,3,5-Trimethylbenzene	1
1,3-Dichlorobenzene	1
1,3-Dichloropropane	1
1,4-Dichlorobenzene	1
2,2-Dichloropropane	1
2-Butanone	5
2-Chloroethylvinyl ether	5
2-Chlorotoluene	1
2-Hexanone	5
4-Chlorotoluene	1
4-Isopropyltoluene	1
4-Methyl-2-pentanone	5
Acetone	5
Acrolein	10
Acrylonitrile	10
Benzene	1

Table A-10. Volatile Organic Compounds (Cont.)

Analytes	Limit of Quantitation Water (μg/L)
Bromobenzene	1
Bromochloromethane	1
Bromodichloromethane	1
Bromoform	1
Bromomethane	1
Carbon disulfide	5
Carbon tetrachloride	1
Chlorobenzene	1
Chloroethane	1
Chloroform	1
Chloromethane	1
cis-1,3-Dichloropropylene	1
Dibromochloromethane	1
Dibromomethane	1
Dichlorodifluoromethane	1
Ethylbenzene	1
Hexachlorobutadiene	1
Iodomethane	5
Isopropylbenzene	1
m,p-Xylenes	2
Methylene chloride	5
Naphthalene	1
n-Butylbenzene	1
n-Propylbenzene	1
o-Xylene	1
sec-Butylbenzene	1
Styrene	1
tert-Butylbenzene	1
Tetrachloroethylene	1
Toluene	1
Toluene-d8	1
trans-1,2-Dichloroethylene	1
trans-1,3-Dichloropropylene	1
Trichloroethylene	1
Trichlorofluoromethane	1
Trichlorotrifluoroethane	5
Vinyl chloride	1
Xylenes (total)	3

Table A-11. Semivolatile Organic Compounds

	Limit of Quantitation	
Analytes	**Water (μg/L)**	**Sediments (mg/kg)**
1,2,4-Trichlorobenzene	10	0.33
1,2-Dichlorobenzene	10	0.33
1,2-Diphenylhydrazine	10	0.33
1,3-Dichlorobenzene	10	0.33
1,4-Dichlorobenzene	10	0.33
2,4,5-Trichlorophenol	10	0.33
2,4,6-Trichlorophenol	10	0.33
2,4-Dichlorophenol	10	0.33
2,4-Dimethylphenol	10	0.33
2,4-Dinitrophenol	20	0.67
2,4-Dinitrotoluene	10	0.33
2,6-Dinitrotoluene	10	0.33
2-Chloronaphthalene	1	0.03
2-Chlorophenol	10	0.33
2-Methyl-4,6-dinitrophenol	10	0.33
2-Methylnaphthalene	1	0.03
2-Nitrophenol	10	0.33
2-Picoline	10	0.33
3,3'-Dichlorobenzidine	10	0.33
4-Bromophenylphenylether	10	0.33
4-Chloro-3-methylphenol	10	0.33
4-Chloroaniline	10	0.33
4-Chlorophenylphenylether	10	0.33
4-Nitrophenol	10	0.33
Acenaphthene	1	0.03
Acenaphthylene	1	0.03
Aniline	10	0.33
Anthracene	1	0.03
Benzidine	50	1.67
Benzo(a)anthracene	1	0.03
Benzo(a)pyrene	1	0.03
Benzo(b)fluoranthene	1	0.03
Benzo(ghi)perylene	1	0.03
Benzo(k)fluoranthene	1	0.03
Benzoic acid	20	0.67
Benzyl alcohol	10	0.33
bis(2-Chloroethoxy)methane	10	0.33
bis(2-Chloroethyl) ether	10	0.33
bis(2-Chloroisopropyl)ether	10	0.33
bis(2-Ethylhexyl)phthalate	10	0.03
Butylbenzylphthalate	10	0.33
Chrysene	1	0.03
Dibenzo(a,h)anthracene	1	0.03
Dibenzofuran	10	0.33

Table A-11. Semivolatile Organic Compounds (Cont.)

Analytes	Limit of Quantitation Water (µg/L)	Limit of Quantitation Sediments (mg/kg)
Diethylphthalate	10	0.33
Dimethylphthalate	10	0.33
Di-n-butylphthalate	10	0.33
Di-n-octylphthalate	10	0.33
Fluoranthene	1	0.03
Fluorene	1	0.03
Hexachlorobenzene	10	0.33
Hexachlorobutadiene	10	0.33
Hexachlorocyclopentadiene	10	0.33
Hexachloroethane	10	0.33
Indeno(1,2,3-cd)pyrene	1	0.03
Isophorone	10	0.33
m-Nitroaniline	10	0.33
Naphthalene	1	0.03
Nitrobenzene	10	0.33
N-Methyl-N-nitrosomethylamine	10	0.33
N-Nitrosodiphenylamine	10	0.07
N-Nitrosodipropylamine	10	0.33
o-Nitroaniline	10	0.33
p-(Dimethylamino)azobenzene	10	0.33
Pentachlorophenol	10	0.33
Phenanthrene	1	0.03
Phenol	10	0.33
Pyrene	1	0.03
Pyridine	10	0.33

Table A-12. Polychlorinated Biphenyls

Analytes	Limit of Quantitation Water (µg/L)	Limit of Quantitation Sediments (mg/kg)
Aroclor 1016	0.5	0.003
Aroclor 1221	0.5	0.003
Aroclor 1232	0.5	0.003
Aroclor 1242	0.5	0.003
Aroclor 1248	0.5	0.003
Aroclor 1254	0.5	0.003
Aroclor 1260	0.5	0.003
Aroclor 1262	0.5	0.003

Table A-13. High-Explosives Compounds

	Limit of Quantitation	
Analytes	**Water (μg/L**	**Sediments (mg/kg)**
1,3,5-Trinitrobenzene	0.105	0.08
2,4,6-Trinitrotoluene	0.105	0.08
2,4-Dinitrotoluene	0.105	0.08
2,6-Dinitrotoluene	0.105	0.08
2-Amino-4,6-dinitrotoluene	0.105	0.08
4-Amino-2,6-dinitrotoluene	0.105	0.08
HMX	0.105	0.08
Nitrobenzene	0.105	0.08
RDX	0.105	0.08
Tetryl	0.105	0.08
m-Dinitrobenzene	0.105	0.08
m-Nitrotoluene	0.105	0.08
o-Nitrotoluene	0.105	0.08
p-Nitrotoluene	0.105	0.08

References

DOE 1988a: US Department of Energy, "Internal Dose Conversion Factors for Calculation of Dose to the Public," US Department of Energy report DOE/EH-0071 (July 1988).

DOE 1988b: US Department of Energy, "External Dose-Rate Conversion Factors for Calculation of Dose to the Public," US Department of Energy report DOE/EH-0070 (July 1988).

DOE 1990: US Department of Energy, "Radiation Protection of the Public and the Environment," US Department of Energy Order 5400.5 (February 8, 1990).

EPA 1989a: US Environmental Protection Agency, "40CFR 61, National Emission Standards for Hazardous Air Pollutants, Radionuclides; Final Rule and Notice of Reconsideration," Federal Register 54, 51 653-51 715 (December 15, 1989).

EPA 1989b: US Environmental Protection Agency, "National Interim Primary Drinking Water Regulations," Code of Federal Regulations, Title 40, Parts 141 and 142 (1989), and "National Secondary Drinking Water Regulations," Part 143 (1989).

ESH-17 2000: Air Quality Group, "Quality Assurance Project Plan for the Rad-NESHAP Compliance Project," Air Quality Group Document ESH-17-RN, R1 (January 2000).

ICRP 1988: International Commission on Radiological Protection, "Limits for Intakes of Radionuclides by Workers," ICRP Publication 30, Parts 1, 2, and 3, and their supplements, Annals of the ICRP 2(3/4) -8(4) (1979-1982), and Publication 30, Part 4, 19(4) (1988).

NCRP 1987: National Council on Radiation Protection and Measurements, "Recommendations on Limits for Exposure to Ionizing Radiation," NCRP report No. 91 (June 1987).

NMEIB 1995: New Mexico Environmental Improvement Board, "New Mexico Drinking Water Regulations," (as amended through January 1995).

NMWQCC 1995: New Mexico Water Quality Control Commission, "State of New Mexico Water Quality Standards for Interstate and Intrastate Streams," Section 3-101.K (as amended through January 23, 1995).

Units of Measurement

Throughout this report the International System of Units (SI) or metric system of measurements has been used, with some exceptions. For units of radiation activity, exposure, and dose, US Customary Units (that is, curie [Ci], roentgen [R], rad, and rem) are retained as the primary measurement because current standards are written in terms of these units. The equivalent SI units are the becquerel (Bq), coulomb per kilogram (C/kg), gray (Gy), and sievert (Sv), respectively.

Table B-1 presents prefixes used in this report to define fractions or multiples of the base units of measurements. Scientific notation is used in this report to express very large or very small numbers. Translating from scientific notation to a more traditional number requires moving the decimal point either left or right from the number. If the value given is 2.0×10^3, the decimal point should be moved three numbers (insert zeros if no numbers are given) to the **right** of its present location. The number would then read 2,000. If the value given is 2.0×10^{-5}, the decimal point should be moved five numbers to the **left** of its present location. The result would be 0.00002.

Table B-2 presents conversion factors for converting SI units into US Customary Units. Table B-3 presents abbreviations for common measurements.

Data Handling of Radiochemical Samples

Measurements of radiochemical samples require that analytical or instrumental backgrounds be subtracted to obtain net values. Thus, net values are sometimes obtained that are lower than the minimum detection limit of the analytical technique. Consequently, individual measurements can result in values of positive or negative numbers. Although a negative value does not represent a physical reality, a valid long-term average of many measurements can be obtained only if the very small and negative values are included in the population calculations (Gilbert 1975).

For individual measurements, uncertainties are reported as one standard deviation. The standard deviation is estimated from the propagated sources of analytical error.

Standard deviations for the station and group (off-site regional, off-site perimeter, and on-site) means are calculated using the following equation:

$$s = \sqrt{\frac{\sum_{i=1}^{N} (\bar{c} - c_i)^2}{(N-1)}},$$

where

c_i = sample i,

$\bar{c}$ = mean of samples from a given station or group, and

N = number of samples a station or group comprises.

This value is reported as one standard deviation (1*s*) for the station and group means.

Tables

Table B-1. Prefixes Used with SI (Metric) Units

Prefix	Factor	Symbol
mega	1 000 000 or 10^6	M
kilo	1 000 or 10^3	k
centi	0.01 or 10^{-2}	c
milli	0.001 or 10–3	m
micro	0.000001 or 10^{-6}	µ
nano	0.000000001 or 10^{-9}	n
pico	0.000000000001 or 10^{-12}	p
femto	0.000000000000001 or 10^{-15}	f
atto	0.000000000000000001 or 10^{-18}	a

Table B-2. Approximate Conversion Factors for Selected SI (Metric) Units

Multiply SI (Metric) Unit	by	to Obtain US Customary Unit
celsius (°C)	9/5 + 32	fahrenheit (°F)
centimeters (cm)	0.39	inches (in.)
cubic meters (m^3)	35.3	cubic feet (ft^3)
hectares (ha)	2.47	acres
grams (g)	0.035	ounces (oz)
kilograms (kg)	2.2	pounds (lb)
kilometers (km)	0.62	miles (mi)
liters (L)	0.26	gallons (gal.)
meters (m)	3.28	feet (ft)
micrograms per gram (µg/g)	1	parts per million (ppm)
milligrams per liter (mg/L)	1	parts per million (ppm)
square kilometers (km^2)	0.386	square miles (mi^2)

Table B-3. Common Measurement Abbreviations and Measurement Symbols

aCi	attocurie
Bq	becquerel
Btu/yr	British thermal unit per year
Ci	curie
cm^3/s	cubic centimeters per second
cpm/L	counts per minute per liter
fCi/g	femtocurie per gram
ft	foot
ft^3/min	cubic feet per minute
ft^3/s	cubic feet per second
kg	kilogram
kg/h	kilogram per hour
lb/h	pound per hour
lin ft	linear feet
m^3/s	cubic meter per second
µCi/L	microcurie per liter
µCi/mL	microcurie per milliliter
µg/g	microgram per gram
µg/m^3	microgram per cubic meter
mL	milliliter
mm	millimeter
µm	micrometer
µmho/cm	micro mho per centimeter
mCi	millicurie
mg	milligram
mR	milliroentgen

Table B-3. Common Measurement Abbreviations and Measurement Symbols (Cont.)

m/s	meters per second
mrad	millirad
mrem	millirem
mSv	millisievert
nCi	nanocurie
nCi/dry g	nanocurie per dry gram
nCi/L	nanocurie per liter
ng/m^3	nanogram per cubic meter
pCi/dry g	picocurie per dry gram
pCi/g	picocurie per gram
pCi/L	picocurie per liter
pCi/m^3	picocurie per cubic meter
pCi/mL	picocurie per milliliter
pg/g	picogram per gram
pg/m^3	picogram per cubic meter
PM_{10}	small particulate matter (less than 10 µm diameter)
$PM_{2.5}$	small particulate matter (less than 2.5 µm diameter)
R	roentgen
s, SD or σ	standard deviation
s.u.	standard unit
sq ft (ft^2)	square feet
TU	tritium unit
>	greater than
<	less than
≥	greater than or equal to
≤	less than or equal to
±	plus or minus
~	approximately

Reference

Gilbert 1975: R. O. Gilbert, "Recommendations Concerning the Computation and Reporting of Counting Statistics for the Nevada Applied Ecology Group," Batelle Pacific Northwest Laboratories report BNWL-B-368 (September 1975).

Description of Technical Areas and Their Associated Programs

Locations of the technical areas (TAs) operated by the Laboratory in Los Alamos County are shown in Figure 1-2. The main programs conducted at each of the areas are listed in this Appendix.

TA-0: The Laboratory has about 180,000 sq ft of leased space for training, support, architectural engineering design, and unclassified research and development in the Los Alamos town site and White Rock. The publicly accessible Community Reading Room and the Bradbury Science Museum are also located in the Los Alamos town site.

TA-2, Omega Site: Omega West Reactor, an 8-MW nuclear research reactor, is located here. It was placed into a safe shutdown condition in 1993 and was removed from the nuclear facilities list. The reactor will be transferred to the institution for placement into the decontamination and decommissioning (D&D) program beginning in 2006.

TA-3, Core Area: The Administration Complex contains the Director's office, administrative offices, and support facilities. Laboratories for several divisions are in this main TA of the Laboratory. Other buildings house central computing facilities, chemistry and materials science laboratories, earth and space science laboratories, physics laboratories, technical shops, cryogenics laboratories, the main cafeteria, and the Study Center. TA-3 contains about 50% of the Laboratory's employees and floor space.

TA-5, Beta Site: This site contains some physical support facilities such as an electrical substation, test wells, several archaeological sites, and environmental monitoring and buffer areas.

TA-6, Two-Mile Mesa Site: The site is mostly undeveloped and contains gas cylinder staging and vacant buildings pending disposal.

TA-8, GT Site (or Anchor Site West): This is a dynamic testing site operated as a service facility for the entire Laboratory. It maintains capability in all modern nondestructive testing techniques for ensuring quality of material, ranging from test weapons components to high-pressure dies and molds. Principal tools include radiographic techniques (x-ray machines with potentials up to 1,000,000 V and a 24-MeV betatron), radioisotope techniques, ultrasonic and penetrant testing, and electromagnetic test methods.

TA-9, Anchor Site East: At this site, fabrication feasibility and physical properties of explosives are explored. New organic compounds are investigated for possible use as explosives. Storage and stability problems are also studied.

TA-11, K Site: Facilities are located here for testing explosives components and systems, including vibration testing and drop testing, under a variety of extreme physical environments. The facilities are arranged so that testing may be controlled and observed remotely and so that devices containing explosives or radioactive materials, as well as those containing nonhazardous materials, may be tested.

TA-14, Q Site: This dynamic testing site is used for running various tests on relatively small explosive charges for fragment impact tests, explosives sensitivities, and thermal responses.

TA-15, R Site: This is the home of PHERMEX (the pulsed high-energy radiographic machine emitting x-rays), a multiple-cavity electron accelerator capable of producing a very large flux of x-rays for weapons development testing. It is also the site where DARHT (the dual-axis radiographic hydrotest facility) is being constructed. This site is also used for the investigation of weapons functioning and systems behavior in nonnuclear tests, principally through electronic recordings.

TA-16, S Site: Investigations at this site include development, engineering design, prototype manufacture, and environmental testing of nuclear weapons warhead systems. TA-16 is the site of the Weapons Engineering Tritium Facility for tritium handled in gloveboxes. Development and testing of high explosives, plastics, and adhesives and research on process development for manufacture of items using these and other materials are accomplished in extensive facilities.

TA-18, Pajarito Laboratory Site: This is a nuclear facility that studies both static and dynamic behavior of multiplying assemblies of nuclear materials. The Category I quantities of special nuclear materials (SNM) are used to support a wide variety of programs such as Stockpile Management, Stockpile Stewardship, Emergency Response, Nonproliferation, Safeguards, etc. Experiments near critical are operated by remote control using low-power reactors called critical assemblies. The machines are housed in buildings known as kivas and are used primarily to provide a controlled means of assembling a critical amount of fissionable material so that the effects of various shapes, sizes, and configurations can be studied. These machines are also used as a large-quantity source of fission neutrons for experimental purposes. In addition, this facility provides the capability to perform hands-on training and experiments with SNM in various configurations below critical.

TA-21, DP Site: This site has two primary research areas: DP West and DP East. DP West has been in the D&D program since 1992, and six buildings have been demolished. The programs conducted at DP West, primarily in inorganic and biochemistry, were relocated during 1997, and the remainder of the site was scheduled for D&D in future years. DP East is a tritium research site.

TA-22, TD Site: This site is used in the development of special detonators to initiate high-explosive systems. Fundamental and applied research in support of this activity includes investigating phenomena associated with initiating high explosives and research in rapid shock-induced reactions.

TA-28, Magazine Area A: This is an explosives storage area.

TA-33, HP Site: An old, high-pressure, tritium-handling facility located here is being phased out. An intelligence technology group and the National Radio Astronomy Observatory's Very Large Baseline Array Telescope are located at this site.

TA-35, Ten Site: This site is divided into five facility management units. Work here includes nuclear safeguards research and development that are concerned with techniques for nondestructive detection, identification, and analysis of fissionable isotopes. Research is also done on reactor safety, laser fusion, optical sciences, pulsed-power systems, high-energy physics, tritium fabrication, metallurgy, ceramic technology, and chemical plating.

TA-36, Kappa Site: Phenomena of explosives, such as detonation velocity, are investigated at this dynamic testing site.

TA-37, Magazine Area C: This is an explosives storage area.

TA-39, Ancho Canyon Site: The behavior of nonnuclear weapons is studied here, primarily by photographic techniques. Investigations are also made into various phenomenological aspects of explosives, interactions of explosives, explosions involving other materials, shock wave physics, equation state measurements, and pulsed-power systems design.

TA-40, DF Site: This site is used in the development of special detonators to initiate high-explosive systems. Fundamental and applied research in support of this activity includes investigating phenomena associated with the physics of explosives.

TA-41, W Site: Personnel at this site engage primarily in engineering design and development of nuclear components, including fabrication and evaluation of test materials for weapons.

TA-43, Health Research Laboratory: This site is adjacent to the Los Alamos Medical Center in the town site. Research performed at this site includes structural, molecular, and cellular radiobiology, biophysics, mammalian radiobiology, mammalian metabolism, biochemistry, and genetics. The Department of Energy Los Alamos Area Office is also located within TA-43.

TA-46, WA Site: This TA contains two facility management units. Activities include applied photochemistry research including the development of technology for laser isotope separation and laser enhancement of chemical processes. A new facility completed during 1996 houses research in inorganic and materials chemistry. The Sanitary Wastewater System Facility is located at the east end of this site. Environmental management operations are also located here.

TA-48, Radiochemistry Site: Laboratory scientists and technicians perform research and development (R&D) activities at this site on a wide range of chemical processes including nuclear and radiochemistry, geochemistry, biochemistry, actinide chemistry, and separations chemistry. Hot cells are used to produce medical radioisotopes.

TA-49, Frijoles Mesa Site: This site is currently restricted to carefully selected functions because of its location near Bandelier National Monument and past use in high-explosive and radioactive materials experiments. The Hazardous Devices Team Training Facility is located here.

TA-50, Waste Management Site: This site is divided into two facility management units, which include managing the industrial liquid and radioactive liquid waste received from Laboratory technical areas and activities that are part of the waste treatment technology effort.

TA-51, Environmental Research Site: Research and experimental studies on the long-term impact of radioactive waste on the environment and types of waste storage and coverings are performed at this site.

TA-52, Reactor Development Site: A wide variety of theoretical and computational activities related to nuclear reactor performance and safety are done at this site.

TA-53, Los Alamos Neutron Science Center: The Los Alamos Neutron Science Center, including the linear proton accelerator, the Manuel Lujan Jr. Neutron Scattering Center, and a medical isotope production facility is located at this TA. Also located at TA-53 are the Accelerator Production of Tritium Project Office, including the Low-Energy Demonstration Accelerator, and R&D activities in accelerator technology and high-power microwaves.

TA-54, Waste Disposal Site: This site is divided into two facility management units for the radioactive solid and hazardous chemical waste management and disposal operations and activities that are part of the waste treatment technology effort.

TA-55, Plutonium Facility Site: Processing of plutonium and research on plutonium metallurgy are done at this site.

TA-57, Fenton Hill Site: This site is located about 28 miles west of Los Alamos on the southern edge of the Valles Caldera in the Jemez Mountains and was the location of the Laboratory's now decommissioned Hot Dry Rock geothermal project. The site is used for the testing and development of downhole well-logging instruments and other technologies of interest to the energy industry. The high elevation and remoteness of the site make Fenton Hill a choice location for astrophysics experiments. A gamma ray observatory is located at the site.

TA-58: This site is reserved for multiuse experimental sciences requiring close functional ties to programs currently located at TA-3.

TA-59, Occupational Health Site: Occupational health and safety and environmental management activities are conducted at this site. Emergency management offices are also located here.

TA-60, Sigma Mesa: This area contains physical support and infrastructure facilities, including the Test Fabrication Facility and Rack Assembly and the Alignment Complex.

TA-61, East Jemez Road: This site is used for physical support and infrastructure facilities, including the Los Alamos County sanitary landfill.

TA-62: This site is reserved for multiuse experimental science, public and corporate interface, and environmental research and buffer zones.

TA-63: This is a major growth area at the Laboratory with expanding environmental and waste management functions and facilities. This area contains physical support facilities operated by Johnson Controls Northern New Mexico.

TA-64: This is the site of the Central Guard Facility and headquarters for the Laboratory Hazardous Materials Response Team.

TA-66: This site is used for industrial partnership activities.

TA-67: This is a dynamic testing area that contains significant archeological sites.

TA-68: This is a dynamic testing area that contains archeological and environmental study areas.

TA-69: This undeveloped TA serves as an environmental buffer for the dynamic testing area.

TA-70: This undeveloped TA serves as an environmental buffer for the high-explosives test area.

TA-71: This undeveloped TA serves as an environmental buffer for the high-explosives test area.

TA-72: This is the site of the Protective Forces Training Facility.

TA-73: This area is the Los Alamos Airport.

TA-74, Otowi Tract: This large area, bordering the Pueblo of San Ildefonso on the east, is isolated from most of the Laboratory and contains significant concentrations of archeological sites and an endangered species breeding area. This site also contains Laboratory water wells and future well fields.

Related Websites

For more information on environmental topics at Los Alamos National Laboratory, access the following Web sites:

http://lib-www.lanl.gov/pubs/la-13891.htm provides access to *Environmental Surveillance at Los Alamos during 2000*.

http://lib-www.lanl.gov/la-pubs/lalp-01-198.pdf provides access to *Overview of Environmental Surveillance at Los Alamos during 2000*.

http://www.lanl.gov reaches the Los Alamos National Laboratory Web site.

http://www.energy.gov reaches the national Department of Energy Web site.

http://labs.ucop.edu provides information on the three laboratories managed by the University of California.

http://www.esh.lanl.gov/~AirQuality accesses LANL's Air Quality Group.

http://www.esh.lanl.gov/~esh18/ accesses LANL's Water Quality and Hydrology Group.

http://www.esh.lanl.gov/~esh19/ accesses LANL's Hazardous and Solid Waste Group.

http://www.esh.lanl.gov/%7Eesh20/ accesses LANL's Ecology Group.

http://erproject.lanl.gov provides information on LANL's Environmental Restoration Project.

activation products	Radioactive products generated as a result of neutrons and other subatomic particles interacting with materials such as air, construction materials, or impurities in cooling water. These activation products are usually distinguished, for reporting purposes, from fission products.
albedo dosimeters	Albedo dosimeters are used to measure neutrons around TA-18. They use a neutron-sensitive polyethylene phantom to capture neutron backscatter to simulate the human body.
alpha particle	A positively charged particle (identical to the helium nucleus) composed of two protons and two neutrons that are emitted during decay of certain radioactive atoms. Alpha particles are stopped by several centimeters of air or a sheet of paper.
ambient air	The surrounding atmosphere as it exists around people, plants, and structures. It is not considered to include the air immediately adjacent to emission sources.
aquifer	A saturated layer of rock or soil below the ground surface that can supply usable quantities of groundwater to wells and springs. Aquifers can be a source of water for domestic, agricultural, and industrial uses.
artesian well	A well in which the water rises above the top of the water-bearing bed.
background radiation	Ionizing radiation from sources other than the Laboratory. This radiation may include cosmic radiation; external radiation from naturally occurring radioactivity in the earth (terrestrial radiation), air, and water; internal radiation from naturally occurring radioactive elements in the human body; worldwide fallout; and radiation from medical diagnostic procedures.
beta particle	A negatively charged particle (identical to the electron) that is emitted during decay of certain radioactive atoms. Most beta particles are stopped by 0.6 cm of aluminum.
biota	The types of animal and plant life found in an area.
blank sample	A control sample that is identical, in principle, to the sample of interest, except that the substance being analyzed is absent. The measured value or signals in blanks for the analyte is believed to be caused by artifacts and should be subtracted from the measured value. This process yields a net amount of the substance in the sample.
blind sample	A control sample of known concentration in which the expected values of the constituent are unknown to the analyst.
BOD	Biochemical (biological) oxygen demand. A measure of the amount of oxygen in biological processes that breaks down organic matter in water; a measure of the organic pollutant load. It is used as an indicator of water quality.
CAA	Clean Air Act. The federal law that authorizes the Environmental Protection Agency (EPA) to set air quality standards and to assist state and local governments to develop and execute air pollution prevention

	and control programs.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980. Also known as Superfund, this law authorizes the federal government to respond directly to releases of hazardous substances that may endanger health or the environment. The EPA is responsible for managing Superfund.
CFR	Code of Federal Regulations. A codification of all regulations developed and finalized by federal agencies in the *Federal Register*.
COC	Chain-of-Custody. A method for documenting the history and possession of a sample from the time of collection, through analysis and data reporting, to its final disposition.
contamination	(1) Substances introduced into the environment as a result of people's activities, regardless of whether the concentration is a threat to health (see pollution). (2) The deposition of unwanted radioactive material on the surfaces of structures, areas, objects, or personnel.
controlled area	Any Laboratory area to which access is controlled to protect individuals from exposure to radiation and radioactive materials.
Ci	Curie. Unit of radioactivity. One Ci equals 3.70×10^{10} nuclear transformations per second.
cosmic radiation	High-energy particulate and electromagnetic radiations that originate outside the earth's atmosphere. Cosmic radiation is part of natural background radiation.
CWA	Clean Water Act. The federal law that authorizes the EPA to set standards designed to restore and maintain the chemical, physical, and biological integrity of the nation's waters.
DOE	US Department of Energy. The federal agency that sponsors energy research and regulates nuclear materials used for weapons production.
dose	A term denoting the quantity of radiation energy absorbed.
EDE	Effective dose equivalent. The hypothetical whole-body dose that would give the same risk of cancer mortality and serious genetic disorder as a given exposure but that may be limited to a few organs. The effective dose equivalent is equal to the sum of individual organ doses, each weighted by degree of risk that the organ dose carries. For example, a 100-mrem dose to the lung, which has a weighting factor of 0.12, gives an effective dose that is equivalent to $100 \times 0.12 = 12$ mrem. CEDE: committed effective dose equivalent TEDE: total effective dose equivalent
maximum individual dose	The greatest dose commitment, considering all potential routes of exposure from a facility's operation, to an individual at or outside the Laboratory boundary where the highest dose rate occurs. It takes into

	account shielding and occupancy factors that would apply to a real individual.
population dose	The sum of the radiation doses to individuals of a population. It is expressed in units of person-rem. (For example, if 1,000 people each received a radiation dose of 1 rem, their population dose would be 1,000 person-rem.)
whole body dose	A radiation dose commitment that involves exposure of the entire body (as opposed to an organ dose that involves exposure to a single organ or set of organs).
EA	Environmental Assessment. A report that identifies potentially significant environmental impacts from any federally approved or funded project that may change the physical environment. If an EA shows significant impact, an Environmental Impact Statement is required.
effluent	A liquid waste discharged to the environment.
EIS	Environmental Impact Statement. A detailed report, required by federal law, on the significant environmental impacts that a proposed major federal action would have on the environment. An EIS must be prepared by a government agency when a major federal action that will have significant environmental impacts is planned.
emission	A gaseous waste discharged to the environment.
environmental compliance	The documentation that the Laboratory complies with the multiple federal and state environmental statutes, regulations, and permits that are designed to ensure environmental protection. This documentation is based on the results of the Laboratory's environmental monitoring and surveillance programs.
environmental monitoring	The sampling of contaminants in liquid effluents and gaseous emissions from Laboratory facilities, either by directly measuring or by collecting and analyzing samples in a laboratory.
environmental surveillance	The sampling of contaminants in air, water, sediments, soils, food-stuffs, and plants and animals, either by directly measuring or by collecting and analyzing samples in a laboratory.
EPA	Environmental Protection Agency. The federal agency responsible for enforcing environmental laws. Although state regulatory agencies may be authorized to administer some of this responsibility, EPA retains oversight authority to ensure protection of human health and the environment.
exposure	A measure of the ionization produced in air by x-ray or gamma ray radiation. (The unit of exposure is the roentgen.)
external radiation	Radiation originating from a source outside the body.
gallery	An underground collection basin for spring discharges.

gamma radiation	Short-wavelength electromagnetic radiation of nuclear origin that has no mass or charge. Because of its short wavelength (high energy), gamma radiation can cause ionization. Other electromagnetic radiation (such as microwaves, visible light, and radiowaves) has longer wavelengths (lower energy) and cannot cause ionization.
GENII	Computer code used to calculate doses from all pathways (air, water, foodstuffs, and soil).
gross alpha	The total amount of measured alpha activity without identification of specific radionuclides.
gross beta	The total amount of measured beta activity without identification of specific radionuclides.
groundwater	Water found beneath the surface of the ground. Groundwater usually refers to a zone of complete water saturation containing no air.
^{3}H	Tritium.
half-life, radioactive	The time required for the activity of a radioactive substance to decrease to half its value by inherent radioactive decay. After two half-lives, one-fourth of the original activity remains ($1/2 \times 1/2$), after three half-lives, one-eighth ($1/2 \times 1/2 \times 1/2$), and so on.
hazardous waste	Wastes exhibiting any of the following characteristics: ignitability, corrosivity, reactivity, or yielding toxic constituents in a leaching test. In addition, EPA has listed as hazardous other wastes that do not necessarily exhibit these characteristics. Although the legal definition of hazardous waste is complex, the term generally refers to any waste that EPA believes could pose a threat to human health and the environment if managed improperly. Resource Conservation and Recovery Act (RCRA) regulations set strict controls on the management of hazardous wastes.
hazardous waste constituent	The specific substance in a hazardous waste that makes it hazardous and therefore subject to regulation under Subtitle C of RCRA.
HSWA	Hazardous and Solid Waste Amendments of 1984 to RCRA. These amendments to RCRA greatly expanded the scope of hazardous waste regulation. In HSWA, Congress directed EPA to take measures to further reduce the risks to human health and the environment caused by hazardous wastes.
hydrology	The science dealing with the properties, distribution, and circulation of natural water systems.
internal radiation	Radiation from a source within the body as a result of deposition of radionuclides in body tissues by processes such as ingestion, inhalation, or implantation. Potassium-40, a naturally occurring radionuclide, is a major source of internal radiation in living organisms. Also called self-irradiation.
ionizing radiation	Radiation possessing enough energy to remove electrons from the substances through which it passes. The primary contributors to

ionizing radiation are radon, cosmic and terrestrial sources, and medical sources such as x-rays and other diagnostic exposures.

isotopes Forms of an element having the same number of protons in their nuclei but differing in the number of neutrons. Isotopes of an element have similar chemical behaviors but can have different nuclear behaviors.

- long-lived isotope - A radionuclide that decays at such a slow rate that a quantity of it will exist for an extended period (half-life is greater than three years).
- short-lived isotope - A radionuclide that decays so rapidly that a given quantity is transformed almost completely into decay products within a short period (half-life is two days or less).

LLW Low-level waste. The level of radioactive contamination in LLW is not strictly defined. Rather, LLW is defined by what it is not. It does not include nuclear fuel rods, wastes from processing nuclear fuels, transuranic (TRU) waste, or uranium mill tailings.

MCL Maximum contaminant level. Maximum permissible level of a contaminant in water that is delivered to the free-flowing outlet of the ultimate user of a public water system (see Appendix A and Table A-6). The MCLs are specified by the EPA.

MEI Maximally exposed individual. The average exposure to the population in general will always be less than to one person or subset of persons because of where they live, what they do, and their individual habits. To try to estimate the dose to the MEI, one tries to find that population subgroup (and more specifically, the one individual) that potentially has the highest exposure, intake, etc. This becomes the MEI.

mixed waste Waste that contains a hazardous waste component regulated under Subtitle C of the RCRA and a radioactive component consisting of source, special nuclear, or byproduct material regulated under the federal Atomic Energy Act (AEA).

mrem Millirem. See definition of rem. The dose equivalent that is one-thousandth of a rem.

NEPA National Environmental Policy Act. This federal legislation, passed in 1969, requires federal agencies to evaluate the impacts of their proposed actions on the environment before decision making. One provision of NEPA requires the preparation of an EIS by federal agencies when major actions significantly affecting the quality of the human environment are proposed.

NESHAP National Emission Standards for Hazardous Air Pollutants. These standards are found in the CAA; they set limits for such pollutants as beryllium and radionuclides.

nonhazardous waste Chemical waste regulated under the Solid Waste Act, Toxic Substances Control Act, and other regulations, including asbestos, PCB, infectious

	wastes, and other materials that are controlled for reasons of health, safety, and security.
NPDES	National Pollutant Discharge Elimination System. This federal program, under the Clean Water Act, requires permits for discharges into surface waterways.
nuclide	A species of atom characterized by the constitution of its nucleus. The nuclear constitution is specified by the number of protons, number of neutrons, and energy content—or alternately, by the atomic number, mass number, and atomic mass. To be a distinct nuclide, the atom must be capable of existing for a measurable length of time.
outfall	The location where wastewater is released from a point source into a receiving body of water.
PCB	Polychlorinated biphenyls. A family of organic compounds used since 1926 in electric transformers, lubricants, carbonless copy paper, adhesives, and caulking compounds. PCB are extremely persistent in the environment because they do not break down into new and less harmful chemicals. PCB are stored in the fatty tissues of humans and animals through the bioaccumulation process. EPA banned the use of PCB, with limited exceptions, in 1976.
PDL	Public Dose Limit. The new term for Radiation Protection Standards, a standard for external and internal exposure to radioactivity as defined in DOE Order 5400.5 (see Appendix A and Table A-1).
perched groundwater	A groundwater body above a slow-permeablity rock or soil layer that is separated from an underlying main body of groundwater by a vadose zone.
person-rem	A quantity used to describe the radiological dose to a population. Population doses are calculated according to sectors, and all people in a sector are assumed to get the same dose. The number of person-rem is calculated by summing the modeled dose to all receptors in all sectors. Therefore, person-rem is the sum of the number of people times the dose they receive.
pH	A measure of the hydrogen ion concentration in an aqueous solution. Acidic solutions have a pH less than 7, basic solutions have a pH greater than 7, and neutral solutions have a pH of 7.
pollution	Levels of contamination that may be objectionable (perhaps because of a threat to health [see contamination]).
point source	An identifiable and confined discharge point for one or more water pollutants, such as a pipe, channel, vessel, or ditch.
ppb	Parts per billion. A unit measure of concentration equivalent to the weight/volume ratio expressed as µg/L or ng/mL. Also used to express the weight/weight ratio as ng/g or µg/kg.
ppm	Parts per million. A unit measure of concentration equivalent to the

weight/volume ratio expressed as mg/L. Also used to express the weight/weight ratio as µg/g or mg/kg.

QA Quality assurance. Any action in environmental monitoring to ensure the reliability of monitoring and measurement data. Aspects of quality assurance include procedures, interlaboratory comparison studies, evaluations, and documentation.

QC Quality control. The routine application of procedures within environmental monitoring to obtain the required standards of performance in monitoring and measurement processes. QC procedures include calibration of instruments, control charts, and analysis of replicate and duplicate samples.

rad Radiation absorbed dose. The rad is a unit for measuring energy absorbed in any material. Absorbed dose results from energy being deposited by the radiation. It is defined for any material. It applies to all types of radiation and does not take into account the potential effect that different types of radiation have on the body.

1 rad = 1,000 millirad (mrad)

radionuclide An unstable nuclide capable of spontaneous transformation into other nuclides through changes in its nuclear configuration or energy level. This transformation is accompanied by the emission of photons or particles.

RESRAD A computer modeling code designed to model radionuclide transport in the environment.

RCRA Resource Conservation and Recovery Act of 1976. RCRA is an amendment to the first federal solid waste legislation, the Solid Waste Disposal Act of 1965. In RCRA, Congress established initial directives and guidelines for EPA to regulate hazardous wastes.

release Any discharge to the environment. Environment is broadly defined as water, land, or ambient air.

rem Roentgen equivalent man. The rem is a unit for measuring dose equivalence. It is the most commonly used unit and pertains only to people. The rem takes into account the energy absorbed (dose) and the biological effect on the body (quality factor) from the different types of radiation.

rem = rad × quality factor

1 rem = 1,000 millirem (mrem)

SAL Screening Action Limit. A defined contaminant level that if exceeded in a sample requires further action.

SARA Superfund Amendments and Reauthorization Act of 1986. This act modifies and reauthorizes CERCLA. Title III of this act is known as the Emergency Planning and Community Right-to-Know Act of 1986.

saturated zone	Rock or soil where the pores are completely filled with water, and no air is present.
SWMU	Solid waste management unit. Any discernible site at which solid wastes have been placed at any time, regardless of whether the unit was intended for the management of solid or hazardous waste. Such units include any area at or around a facility at which solid wastes have been routinely and systematically released, such as waste tanks, septic tanks, firing sites, burn pits, sumps, landfills (material disposal areas), outfall areas, canyons around LANL, and contaminated areas resulting from leaking product storage tanks (including petroleum).
terrestrial radiation	Radiation emitted by naturally occurring radionuclides such as internal radiation source; the natural decay chains of uranium-235, uranium-238, or thorium-232; or cosmic-ray-induced radionuclides in the soil.
TLD	Thermoluminescent dosimeter. A material (the Laboratory uses lithium fluoride) that emits a light signal when heated to approximately 300°C. This light is proportional to the amount of radiation (dose) to which the dosimeter was exposed.
TRU	Transuranic waste. Waste contaminated with long-lived transuranic elements in concentrations within a specified range established by DOE, EPA, and Nuclear Regulatory Agency. These are elements shown above uranium on the chemistry periodic table, such as plutonium, americium, and neptunium, that have activities greater than 100 nanocuries per gram.
TSCA	Toxic Substances Control Act. TSCA is intended to provide protection from substances manufactured, processed, distributed, or used in the United States. A mechanism is required by the act for screening new substances before they enter the marketplace and for testing existing substances that are suspected of creating health hazards. Specific regulations may also be promulgated under this act for controlling substances found to be detrimental to human health or to the environment.
tuff	Rock formed from compacted volcanic ash fragments.
uncontrolled area	An area beyond the boundaries of a controlled area (see controlled area in this glossary).
unsaturated zone	See vadose zone in this glossary.
UST	Underground storage tank. A stationary device, constructed primarily of nonearthen material, designed to contain petroleum products or hazardous materials. In a UST, 10% or more of the volume of the tank system is below the surface of the ground.
vadose zone	The partially saturated or unsaturated region above the water table that does not yield water for wells. Water in the vadose zone is held to rock

	or soil particles by capillary forces and much of the pore space is filled with air.
water table	The water level surface below the ground at which the unsaturated zone ends and the saturated zone begins. It is the level to which a well that is screened in the unconfined aquifer would fill with water.
water year	October through September.
watershed	The region draining into a river, a river system, or a body of water.
wetland	A lowland area, such as a marsh or swamp, that is inundated or saturated by surface water or groundwater sufficient to support hydrophytic vegetation typically adapted for life in saturated soils.
wind rose	A diagram that shows the frequency and intensity of wind from different directions at a particular place.
worldwide fallout	Radioactive debris from atmospheric weapons tests that has been deposited on the earth's surface after being airborne and cycling around the earth.

AA-2	Internal Assessment Group (LANL)
AEC	Atomic Energy Commission
AIP	Agreement in Principle
AIRFA	American Indian Religious Freedom Act
AIRNET	Air Monitoring Network
AL	Albuquerque Operations Office (DOE)
AO	Administrative Order
AQCR	Air Quality Control Regulation (New Mexico)
ARPA	Archeological Resources Protection Act
ATDSR	Agency for Toxic Substances and Disease Registry
BAER	Burned Area Rehabilitation Team
BCG	Biota Concentration Guides
BEIR	biological effects of ionizing radiation
BOD	biochemical/biological oxygen demand
BRMP	Biological Redources Management Plan
BSRL	baseline statistical reference level
BTEX	total aromatic hydrocarbon
Btu	British thermal unit
C	Chemistry Division
CAA	Clean Air Act
C-ACS	Analytical Chemistry Services Group
CAS	Connected Action Statement
CCNS	Concerned Citizens for Nuclear Safety
CEDE	committed effective dose equivalent
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CRO	Community Relations Office (LANL)
CMR	Chemistry and Metallurgy Research (LANL building)
CO	compliance order
COC	chain-of-custody
COD	chemical oxygen demand
COE	Army Corps of Engineers
CRMP	Cultural Resources Management Plan
CWA	Clean Water Act
CY	calendar year
DAC	derived air concentration (DOE)
DARHT	Dual Axis Radiographic Hydrotest facility
DCG	Derived Concentration Guide (DOE)
D&D	decontamination and decommissioning
DEC	DOE Environmental Checklist
DOE	Department of Energy
DOE-EM	DOE, Environmental Management
DOU	Document of Understanding

EA	Environmental Assessment
EDE	effective dose equivalent
EIS	Environmental Impact Statement
EML	Environmental Measurements Laboratory
EO	Executive Order
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ER	Environmental Restoration
ESH	Environment, Safety, & Health
ESH-4	Health Physics Measurements Group (LANL)
ESH-13	ESH Training Group (LANL)
ESH-14	Quality Assurance Support Group (LANL)
ESH-17	Air Quality Group (LANL)
ESH-18	Water Quality & Hydrology Group (LANL)
ESH-19	Hazardous & Solid Waste Group (LANL)
ESH-20	Ecology Group (LANL)
ESO	Environmental Stewardship Office (LANL)
EST	Ecological Studies Team (ESH-20)
FFCA	Federal Facilities Compliance Agreement
FFCAct	Federal Facilities Compliance Act
FFCAgreement	RCRA Federal Facility Compliance Agreement
FFCO	Federal Facility Compliance Order
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FIMAD	Facility for Information Management, Analysis, and Display
FONSI	Finding of No Significant Impact
FWO	Facilities and Waste Operations Division (LANL)
FY	fiscal year
GENII	Generation II
GIS	geographic information system
G/MAP	gaseous/mixed air activation products
GPS	global positioning system
GWPMPP	Groundwater Protection Management Program Plan
HAP	hazardous air pollutants
HAZWOPER	hazardous waste operations (training class)
HE	high-explosive
HEWTP	High-Explosive Wastewater Treatment Plant
HMPT	Hazardous Materials Packaging and Transportation
HPTL	High Pressure Tritium Labortory
HPAL	Health Physics Analytical Laboratory
HSWA	Hazardous and Solid Waste Amendments
HWA	Hazardous Waste Act (New Mexico)
HWMR	Hazardous Waste Management Regulations (New Mexico)
ICRP	International Commission on Radiological Protection
IRMP	Integrated Resources Management Plan

JCNNM	Johnson Controls Northern New Mexico
JENV	JCNNM Environmental Laboratory
LAAO	Los Alamos Area Office (DOE)
LANSCE	Los Alamos Neutron Science Center
LANL	Los Alamos National Laboratory (or the Laboratory)
LEDA	Low-Energy Demonstration Accelerator
LLW	low-level radioactive waste
LLMW	low-level mixed waste
LOD	limits of detection
LOQ	limit of quantitation
MAP	Mitigation Action Plan
MCL	maximum contaminant level
MDA	minimum detectable activity
MEI	maximally exposed individual
MRL	minimum risk level
MSGP	Multi-Sector General Permit
NAGPRA	Native American Grave Protection and Repatriation Act
NCB	NEPA, Cultural, and Biological
NCF	neutron correction factor
NCRP	National Council on Radiation Protection and Measurements
NEPA	National Environmental Policy Act
NERF	NEPA Review Form
NESHAP	National Emission Standards for Hazardous Air Pollutants
NEWNET	Neighborhood Environmental Watch Network
NHPA	National Historic Preservation Act
NMDA	New Mexico Department of Agriculture
NMDOB	New Mexico DOE Oversight Bureau
NMED	New Mexico Environment Department
NMED-SWQB	New Mexico Environment Department's Surface Water Quality Bureau
NMEIB	New Mexico Environmental Improvement Board
NMWQCA	New Mexico Water Quality Control Act
NMWQCC	New Mexico Water Quality Control Commission
NPDES	National Pollutant Discharge Elimination System
NRC	US Nuclear Regulatory Commission
NTISV	Nontraditional In Situ Vitrification
NWP	Nationwide Work Permit
OB/OD	open burning/open detonation
OCP	organochlorine pesticides
ODS	ozone depleting substance
O&G	oil and grease
OHL	Occupational Health Laboratory (LANL)
OSHA	Occupational Safety and Health Act/Administration
PCB	polychlorinated biphenyls
PDL	public dose limit

PE	performance evaluation
PHERMEX	Pulsed high-energy radiographic machine emitting x-rays
ppb	parts per billion
ppm	parts per million
PRS	potential release site
P/VAP	particulate/vapor activation products
QA	quality assurance
QAP	Quality Assurance Program
QC	quality control
RAC	Risk Assessment Corporation
RAWS	Remote Automated Weather System
RCRA	Resource Conservation and Recovery Act
RD&D	research, development, and demonstration
RESRAD	residual radioactive material computer code
RLWTF	Radioactive Liquid Waste Treatment Facility (LANL)
RSRL	regional statistical reference level
SA	supplement assessment
SAL	screening action level
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SEA	Special Environmental Analysis
SHPO	State Historic Preservation Officer (New Mexico)
SLD	Scientific Laboratory Division (New Mexico)
SOC	synthetic organic compound
SOW	statement of work
SPCC	Spill Prevention Control and Countermeasures
SVOC	semivolatile organic compound
SWA	Solid Waste Act
SWEIS	site-wide environmental impact statement
SWIPO	Site-Wide Projects Office
SWPP	Storm Water Prevention Plan
SWMR	solid waste management regulations
SWMU	solid waste management unit
SWS	Sanitary Wastewater Systems Facility (LANL)
TA	Technical Area
TDS	total dissolved solids
T&E	threatened and endangered
TEDE	total effective dose equivalent
TLD	thermoluminescent dosimeter
TLDNET	thermoluminescent dosimeter network
TRI	toxic chemical release inventory
TRU	transuranic waste
TRPH	total recoverable petroleum hydrocarbon
TSCA	Toxic Substances Control Act
TSFF	Tritium Science and Fabrication Facility

TSS	total suspended solids
TTHM	total trihalomethane
TWISP	Transuranic Waste Inspectable Storage Project (LANL)
UC	University of California
USFS	United States Forest Service
USGS	United States Geological Survey
UST	underground storage tank
VAP	vaporous activation products
VCA	voluntary corrective action
VOC	volatile organic compound
WASTENET	Waste Management Areas Network (for air monitoring)
WETF	Weapons Engineering Tritium Facility
WM	Waste Management (LANL)
WSC	Waste Stream Characterization
WWW	World Wide Web

Elemental and Chemical Nomenclature

Actinium	Ac
Aluminum	Al
Americium	Am
Argon	Ar
Antimony	Sb
Arsenic	As
Astatine	At
Barium	Ba
Berkelium	Bk
Beryllium	Be
Bicarbonate	HCO_3
Bismuth	Bi
Boron	B
Bromine	Br
Cadmium	Cd
Calcium	Ca
Californium	Cf
Carbon	C
Cerium	Ce
Cesium	Cs
Chlorine	Cl
Chromium	Cr
Cobalt	Co
Copper	Cu
Curium	Cm
Cyanide	CN
Carbonate	CO_3
Dysprosium	Dy
Einsteinium	Es
Erbium	Er
Europium	Eu
Fermium	Fm
Fluorine	F
Francium	Fr
Gadolinium	Gd
Gallium	Ga
Germanium	Ge
Gold	Au
Hafnium	Hf
Helium	He
Holmium	Ho
Hydrogen	H
Hydrogen oxide	H_2O
Indium	In
Iodine	I
Iridium	Ir
Iron	Fe
Krypton	Kr
Lanthanum	La
Lawrencium	Lr (Lw)
Lead	Pb
Lithium	Li
Lithium fluoride	LiF
Lutetium	Lu
Magnesium	Mg
Manganese	Mn
Mendelevium	Md
Mercury	Hg
Molybdenum	Mo
Neodymium	Nd
Neon	Ne
Neptunium	Np
Nickel	Ni
Niobium	Nb
Nitrate (as Nitrogen)	NO_3-N
Nitrite (as Nitrogen)	NO_2-N
Nitrogen	N
Nitrogen dioxide	NO_2
Nobelium	No
Osmium	Os
Oxygen	O
Palladium	Pd
Phosphaeus	P
Phosphate (as Phosphous)	PO_4-P
Platinum	Pt
Plutonium	Pu
Polonium	Po
Potassium	K
Praseodymium	Pr
Promethium	Pm
Protactinium	Pa
Radium	Ra
Radon	Rn
Rhenium	Re
Rhodium	Rh
Rubidium	Rb
Ruthenium	Ru
Samarium	Sm
Scandium	Sc
Selenium	Se
Silicon	Si
Silver	Ag
Sodium	Na
Stronium	Sr
Sulfate	SO_4
Sulfite	SO_3
Sulfur	S
Tantalum	Ta
Technetium	Tc
Tellurium	Te
Terbium	Tb
Thallium	Tl
Thorium	Th
Thulium	Tm
Tin	Sn
Titanium	Ti
Tritiated water	HTO
Tritium	^3H
Tungsten	W
Uranium	U
Vanadium	V
Xenon	Xe
Ytterbium	Yb
Yttrium	Y
Zinc	Zn
Zirconium	Zr

Standard UC-902 (Environmental Sciences) and UC-707 (Health and Safety) Distribution

US Department of Energy
- Office of Military Applications
- Office of Policy & Assistance
- Office of Research, Development, and Testing Facilities
- Albuquerque Operations Office
- Los Alamos Area Office
- Environmental Measurements Laboratory
- Idaho Operations Office
- Nevada Operations Office
- Oak Ridge Operations Office
- Savannah River Operations Office

US Department of Energy Contractors
- Argonne National Laboratory
- Battelle, Pacific Northwest Laboratories
- Bechtel Nevada
- Brookhaven National Laboratory
- EG&G Mound Applied Technologies
- Lawrence Livermore National Laboratory
- Oak Ridge National Laboratory
- Pantex Plant
- Sandia National Laboratories, New Mexico
- Sandia National Laboratories, California

State of New Mexico
- Office of the Governor
- NM Health Department
- NM Environment Department
- NM Environment Improvement Board
- NM Oil Conservation Division
- NM Energy, Minerals, & Natural Resources Department
- NM State Engineer's Office
- Scientific Laboratory Division

Other External Distribution
University of California
- President's Council, Office of the President
- Environment, Health, and Safety Office

Environmental Protection Agency
NM Congressional Delegation
Elected Officials
County of Los Alamos
NM Office of Indian Affairs
Indian Pueblo Governors, Northern NM
- Pueblo of Cochiti
- Pueblo of Jemez
- Pueblo of Nambé
- Pueblo of Picuris
- Pueblo of Pojoaque
- Pueblo of San Ildefonso

Indian Pueblo Governors, Northern NM (Cont.)
- Pueblo of San Juan
- Pueblo of Santa Clara
- Pueblo of Santo Domingo
- Pueblo of Taos
- Pueblo of Tesuque

Eight Northern Indian Pueblo Council
- Pueblo Office of Environmental Protection

Bureau of Indian Affairs
National Park Service
Bandelier National Monument
US Fish and Wildlife Service
US Geological Survey
Concerned Citizens for Nuclear Safety
Los Alamos Study Group
Responsive Environmental Action League
Johnson Controls, Inc.
Libraries
- Mesa Public Library, Los Alamos, NM
- Mesa Public Library, White Rock Branch
- UNM-LA, Los Alamos, NM
- Santa Fe Public Library, Santa Fe, NM
- New Mexico State Library, Santa Fe, NM

Media
- The Monitor, Los Alamos, NM
- The New Mexican, Santa Fe, NM
- The Reporter, Santa Fe, NM
- The Rio Grande Sun, Española, NM
- The Taos News, Taos, NM
- Albuquerque Journal, Albuquerque, NM
- Albuquerque Journal North, Santa Fe, NM
- Albuquerque Tribune, Albuquerque, NM
- KRSN Radio, Los Alamos, NM
- KOAT-TV, Albuquerque, NM
- KOB-TV, Albuquerque, NM
- KGGM-TV, Albuquerque, NM

Internal Distribution
Director's Office
- Director
- Laboratory Counsel
- Public Affairs Officer

Environment, Safety, & Health Division Office
Group ESH-1, Health Physics Operations
Group ESH-2, Occupational Medicine
Group ESH-3, Facility Risk Assessment
Group ESH-4, Health Physics Measurements
Group ESH-7, Occurrence
Group ESH-13, ES&H Training
Group ESH-17, Air Quality
Group ESH-18, Water Quality and Hydrology
Group ESH-19, Hazardous and Solid Waste
Group ESH-20, Ecology Group
Other Laboratory Groups